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INDIAN SCIENCE ABSTRACTS

(Being an Annotated Bibliography of Science in India)

1938

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II. MATHEMATICS

(including Mathematics, Astronomy and Geodesy).

ALGEBRA.

1. CHOWLA, INDER—A Theorem in the additive theory of numbers. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 160-161, (1938).

In this paper the following theorem has been proved:—
Let $\xi_1, \xi_2, \xi_3 \ldots$ be a set of increasing positive integers such that the number of ξ not exceeding x is greater than $c_1 x$ (for $x > x_0$), where c_1 is an absolute positive constant. Then the number of solutions of

$$n = a\xi_u^2 + b\xi_v^2 + c\xi_w^2,$$

where a, b, c are fixed positive integers and $n \leq x$, is greater than $c_2 x$ for large x where c_2 is an absolute positive constant.

A. C. B.

2. DAS GUPTA, P. N. and CHATTERJI, N.—On the reciprocal linear complexes of the system of linear complexes obtained from two quaternary quadrics associated with two linear complexes. *Bull. Cal. Math. Soc.*, XXX, No. 2, pp. 31-34, (1938).

In this paper, the reciprocal lines of the linear complexes, obtained in the irreducible list, with reference to the basic quadrics have been worked out and their associated geometry worked out.

A. C. B.

3. GUPTA, HANSRAJ—On a property of self-sufficient sets. *Mathematics Student*, VI, p. 73, (1938).

A set of n distinct non-zero positive integers $a_1, a_2, a_3, \ldots, a_n$ where each $a < p$, p being an odd prime, is defined as a self-sufficient p-set, when the product of every two (or more) members of the set is congruent modulo p, to a member of the set itself. In this note, the author proves that the n members of a self-sufficient p-set are the k-ic residues of p, where $kn = p-1$.

H. G.

4. GUPTA, HANSRAJ—A Generalisation of Leudesdorf's Theorem. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 390–392, (1938).

If $a_1, a_2, a_3, \ldots, a_h$ be the least positive reduced system of residues of an integer $m > 2$, and G_r denotes the sum of the products of the a's taken r at a time, then the author proves that

$$2G_{2k+1} \equiv (h-2k)mG_{2k} \pmod{m^3}.$$

Hence the following generalisation of Leudesdorf's Theorem is proved:

$$2(m, N_g)G_{2k+1} \equiv 0 \pmod{m^2},$$

where $$g = (h, 2k) \quad \text{and} \quad N_g = \prod_{(p-1)\,|\,g} p^{\left[1+\frac{2}{p}\right]},$$

p being a prime $\geqslant 2$.

H. G.

5. **Gupta, Hansraj**—Waring's Theorem for Powers of Primes. *Jour. Ind. Math. Soc.*, III, pp. 136–145, (1938).

The author conjectures that for every $n \geqslant n_0 > 6$, where n_0 remains to be determined, every positive integer is a sum of I nth powers of primes at the most where

$$I=\left[\left(\frac{3}{2}\right)^n\right]+2^n-2.$$

In particular it is shown that numbers from 7^{12} to 10^{48} (if not beyond) can be expressed as the sums of at the most 1670 twelfth powers of primes

It is finally stated that the real Waring's Problem aims at finding two numbers G and H, such that

(i) every number $>G$ can be expressed as the sum of H nth powers of primes, at the most;

and (ii) there exists an infinity of numbers $>G$ which requires no less than H powers for their expression.

H. G.

6. **Krishnaswami Ayyangar, A. A.**—A new study of the half-regular continued fraction. *Mathematics Student*, VI, No. 2, pp. 45-67, (1938).

In this paper the author studied the structure and properties of the several types of half-regular continued fractions by means of the transformations which convert a simple continued fraction into a half regular one of the type

$$b_0+\frac{\xi_1}{b_1+}\,\frac{\xi_2}{b_2+}\cdots\cdots\frac{\xi_n}{b_n+}\cdots\cdots,$$

where $|\xi_n|=1$, $b_n+\xi_{n+1}\geqslant 1$, and b_n a positive integer >1, if final.

A. C. B.

7. **Pillai, S. S.**—On the addition of residue classes. *Proc. Ind Acad. Sci.*, VII, Sec. A, pp. 1-4, (1938).

8. **Vaidyanathaswamy, R.**—Quasi-Boolean Algebras and many-valued logics. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 165–170, (1938).

9. **Vaidyanathaswamy, R.** and **Venkatarayudu, T.**—Canonical basis for ideals in a polynomial Domain over a commutative ring with finite basis for ideals. *Journ. Ind. Math. Soc.*, N.S., III, No. 2, pp. 49–53, (1938).

If A be a commutative ring with unit element and $A[x]$ . . . denote the ring of polynomials in x with coefficient from A, then Hilbert's theorem is:—

'If every ideal in A has a finite basis, then every ideal in $A[x]$ also has a finite basis.'

The proof of this as given by Van dar Waerden gives no information beyond the fact that every ideal in $A[x]$ has a finite basis. By reversing the argument in this proof the authors were able to give actually a canonical basis for every ideal in $A[x]$ which would be found to be a powerful tool in several applications.

A. C. B.

10. **Venkatarayudu, T.**—Ideal theory of the Abelian Group-Algebra. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 118–129, (1938).

11. **Ziauddin, M.**—On Differential Operators developed by O'Toole. *Ann. Math. Statistics (U.S.A.)*, IX, No. 1, pp. 63–65, (1938)

Differential operators for symmetric functions given by O'Toole in his paper (*Ann. Math. Statistics*, 2 (1931), 102-149), and some formulae connected with them, have been deduced from Hammond's operators discussed by Macmahon (Combinatory Analysis 1) in this paper.

Further hypersymmetric functions are dealt with.

M. Z.

12. **Ziauddin, M.**—Some more formulae for the Bernoullian Numbers. *Mathematics Student,* V, pp. 155–157, (1938).

This paper is a continuation of the author's previous paper published in *Math. Student,* Vol. 3, 141–151.

With the help of symmetric functions and determinants $B_{\frac{n}{2}}$ is expressed as a recurrent and the following recurrence formula for the Bernoullian numbers is given

$$\frac{1}{2}+\sum_{t=1}^{n/2}(-1)^t\binom{n}{2t-1}B_t=(-1)^{\frac{n}{2}+1}B_{\frac{n}{2}},$$

where n is even. When n is odd the right hand side is zero.

M. Z.

Analysis.

13. **Banerji, A. C. and Bhatnagar, P. L.**—The solution of certain types of Differential Equations. *Proc. Nat. Acad. Sci. India,* VIII, Part 3, pp. 84–92, (1938).

In this paper, the differential equations

$$\frac{d^2y}{dx^2}+y-c^2x^ny=0$$

and

$$\frac{d^2y}{dx^2}+y-4\beta^2c^2x^2e^{2\beta x^2}y=0$$

have been solved.

In the case of the second equation, the different cases arising by taking different signs of β and c have been dealt with at length and the corresponding primitive in each case is given separately.

A. C. B.

14. **Bhatnagar, P. L.**—On the summability of the conjugate series of Fourier Series. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 83–90, (1938).

In this paper, it has been proved that the conjugate series

$$\sum_{n=1}^{\infty}(b_n\cos nx-a_n\sin nx)$$

is summable (c, δ) for $\delta > 1$ to the sum

$$\frac{1}{4\pi}\int_0^{\pi}\Psi(t)\operatorname{cosec}^2\frac{t}{2}\,dt,$$

at a point x, where this integral exists at least as a non-absolutely convergent integral.

A. C. B.

15. **Bhatnagar, P. L.**—The absolute summability of the conjugate series of the Derived Fourier Series. *Bull. Cal. Math. Soc.*, XXX, No. 1, pp. 17–26, (1938).

The absolute summability of the conjugate-derived series

$$\sum_{n=1}^{\infty}n(a_n\cos n\theta+b_n\sin n\theta)$$

has been studied.

The following two theorems have been established:—

Theorem 1: If for $0 < \eta < \pi$

$$\int_0^{\eta} \frac{|\phi(t)|}{t^2}\, dt < \infty,$$

then the series under consideration is absolutely summable (A) at $t = 0$, where

$$\phi(t) = f(\theta+t)+f(\theta-t)-2f(\theta).$$

Theorem 2: If for some α, a non-negative integer and $0 < \eta < \pi$,

$$\int_0^{\eta} \frac{|\phi_\alpha(t)|}{t^2}\, dt < \delta,$$

the series is summable (A) at $t = \theta$, where

$$\phi_\alpha(t) = \underline{|\alpha+1}\; \frac{\Phi_\alpha(t)}{t^\alpha}$$

and $$\Phi_\alpha(t) = \frac{1}{\underline{|\alpha}} \int_0^t (t-u)^{\alpha-1}\phi(u)\, du.$$

A. C. B.

16. Brij Mohan and Shastry, B. V.—An inversion formula. *Journ. Ind. Math. Soc.*, N.S., III, No. 2, pp. 46–48, (1938).

If $$f(x) = \int_a^b \frac{\sin(w-x)}{w-x}\phi(w)\, dw,$$

where $$\int_a^b |\phi(\mu)|\, d\mu$$

exists, the authors have shewn that the inversion formulae as obtained by Fox and Brij Mohan also hold for $f(x)$

A. C. B.

17. Dhar, S. C.—In the Operational Representation of M-functions of the Confluent Hypergeometric type. *Philosophical Magazine*, Ser. 7, XXV, p. 416, (1938).

In this paper the author obtains some operational representations of M-functions of the confluent hypergeometric type in the form of hypergeometric functions and, from the known properties of the latter, deduces several new relations and integrals of the former.

S. C. D.

18. Ganapathy Iyer, V.—On the Average Radial increase of a certain class of Integral Functions of Order one and Finite type. *Journ. Ind. Math Soc.*, N.S., III, No. 3, pp. 87–95, (1938).

19. Iyengar, K. S. K.—On Linear Transformations of bounded sequences. I. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 399–410, (1938).

In this paper, the author has considered a class of linear transformations (T) given by the infinite matrix $\|a_{mn}\|$ characterised by four conditions, the reciprocals (T^{-1}) of these transformations and the products of T and T^{-1}.

A. C. B.

20. **Iyengar, K. S. K.**—On Linear Transformations of bounded sequences. II. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 20–38, (1938).

21. **Iyengar, K. S. K.**—On Linear Transformations of bounded sequences. III. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 135–144, (1938).

This part deals with a sub-class of T as defined in Part I of this paper. The direct and inverse transformations of this class are designated by U and U^{-1} which as well as others defined by their products are proved to be commutative. The author has also shewn that transformations corresponding to differences of any real order form a sub-class of the group defined by U, U^{-1} and their products. It is also shown that some important theorems of Anderson are either deducible from, or particular cases of theorems of Parts I and II of this paper. The author has also discussed the generalisations of Knopp's results on 'Mehrfach monotone folgen'.

A. C. B.

22. **Iyengar, K. S. K.**—Theorems on the functional limits of derivative of a function at infinity. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 341–356, (1938).

23. **Madhava Rao, B. S.** and **Iyengar, K. V.**—On an inequality concerning lattice sums. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 524–528, (1938).

Lattice sums of the form

$$f(a, b, c) = \sum \frac{a^{\lambda} n_1{}^2}{(a^2 n_1{}^2 + b^2 n_2{}^2 + c^2 n_3{}^2)^{r}}$$

which appear in theories of optical anisotropy are examined for convergence for different values of λ and r.

B. S. M. R.

24. **Minakshisundaram, S.**—On an infinite system of Non-linear Integral Equations *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 238–242, (1938).

The infinite system of non-linear integral equations

$$y_n(x) = \int_0^x K_n(x, t)\, F_n(t;\, y_1(t),\, y_2(t), \ldots)\, dt \qquad n = 1, 2, \ldots$$

is solved by successive approximations, such that for all values of x in a definite interval $0 \leqslant x \leqslant T$, the series

$$\sum_{n=1}^{\infty} \{y_n(x)\}^2$$

is uniformly convergent, provided the following conditions are satisfied.

(i) The functions $F_n(t;\, x_1,\, x_2, \ldots)$ are continuous with respect to t and

$$\{F_n(t;\, x_1,\, x_2, \ldots) - F_n(t;\, x_1',\, x_2', \ldots)\}^2$$

$$\leqslant l_n^2 \sum_{i=1}^{\infty} \left(x_i - x_i'\right)^2$$

where l_n is a positive constant such that

$$\text{(ii)} \quad \sum_{n=1}^{\infty} l_n^2 \int_0^x \{K_n(x, t)\}^2\, dt < a,$$

(iii) $F_n(t; 0, 0, \ldots) \not\equiv 0 \qquad n = 1, 2, 3, \ldots,$

(iv) $\displaystyle\sum_{n:1}^{\infty} \left\{ \int_0^x K_n(x, t)\, F_n(t; 0, \ldots)\, dt \right\}^2 < b,$

a and *b* being positive constants independent of *x*. The result generalises known results due to Dr. M. R. Siddiqi.

S. M.

25. Minakshisundaram, S.—A Tauberian theorem on (λk) process of summation. *Jour. Ind. Math. Soc.*, (New Series), III, pp. 126–130, (1938).

Let $A^k(w)$ be the *k*th Riesz's sum of the series

$$\sum_{\nu=1}^{\infty} a_\nu$$

with respect to the sequence

$$[\lambda_n],\ 0 < \lambda_1 < \lambda_2 \ldots < \lambda_n \text{ and let}$$

$$R_k(\omega) = \frac{A^k(\omega)}{\omega^k} = \sum_{\lambda_n \leqslant \omega} \left(1 - \frac{\lambda_n}{\omega}\right)^k a_n = \frac{k}{\omega^k} \int_0^\omega (\omega - t)^{k-1} A(t)\, dt,$$

where $A(t) = A^\circ(t)$. Also let

$$\varlimsup_{\omega \to \infty} R_k(\omega) = u_k\,; \quad \varliminf_{\omega \to \infty} R_k(\omega) = l_k$$

and $u = u_0$; $l = l_0$. The following theorem, which is a generalisation of a result on ($\lambda 1$) process due to J. Karamata (*Proc. Lond. Math. Soc.*, 43 (1937), 20–25), constitutes the main result of the paper.

Theorem: (i) If $k > 0$

$$u_k \leqslant u_{k+1} + 2\sqrt{\alpha(u_{k+1} - l_{k+1})}$$

$$l_k \geqslant l_{k+1} - 2\sqrt{\alpha(u_{k+1} - l_{k+1})}.$$

(ii) If $k = 0$

$$u \leqslant u_1 + 2\sqrt{\alpha(u_1 - l_1)}$$

$$l \geqslant l_1 - \alpha.$$

(iii) If $\dfrac{\lambda_n}{\lambda_{n-1}} \to 1,\ l \geqslant l_1 - 2\sqrt{\alpha(u_1 - l_1)},$

where

$$\varliminf_{n \to \infty} \frac{\lambda_n a_n}{\lambda_n - \lambda_{n-1}} = -\alpha \leqslant 0.$$

More generally if

$$\varliminf_{\omega \to \infty} \{A(u\omega) - A(\omega)\} = -\alpha(u),\ u > 0$$

it can be shown that for $\lambda > 1$

$$u_k \leqslant u_{k+1} + \frac{u_{k+1} - l_{k+1}}{\lambda - 1} + (\lambda - 1)^{-1} \int_1^\lambda \alpha(t)\, dt$$

$$l_k \geqslant l_{k+1} - \frac{u_{k+1} - l_{k+1}}{\lambda - 1} - (\lambda - 1)^{-1} \int_{1/\lambda} \alpha(t) dt.$$

S. M.

26. **Minakshisundaram, S.**—On V. Ramaswami's Tauberian theorem on Oscillation. *Jour. Ind. Math. Soc.*, (New Series), III, pp. 131–135, (1938).

Let $f(x)$ be the power series

$$\sum_{0}^{\infty} a_n x^n$$

with radius of convergence equal to 1 and let

$$s_n = a_0 + a_1 + \ldots + a_n.$$

An alternative proof of the following theorem of V. Ramaswami is given.

Theorem: If

$$\lim_{\delta \to 0} \ \underline{\lim}_{n \to \infty} \ \frac{1}{\delta} (s_m - s_n) \geqslant 0$$

$$n \leqslant m \leqslant n(1+\delta)$$

and $f(x) = 0(1)$ as $x \to 1-0$, then $\operatorname{Osc.}_{n \to \infty} s_n = \operatorname{Osc.}_{x \to 1-0} f(x)$.

This theorem is deduced from the following auxiliary theorems.

Let $U = \overline{\lim}_{x \to 1} f(x)$, $L = \underline{\lim}_{x \to 1} f(x)$; $u = \overline{\lim}_{n \to \infty} s_n$, $l = \underline{\lim}_{n \to \infty} s_n$

Theorem 1: If U and L are finite and

$$\overline{\lim}_{n \to \infty} \ na_n = \beta, \ \underline{\lim}_{n \to \infty} \ na_n = -\alpha$$

where $0 \leqslant \alpha, \beta < \infty$, then

$$u < U + 2\sqrt{\alpha\beta}$$

$$l \geqslant L - 2\sqrt{\alpha\beta}$$

Theorem 2: If $\underline{\lim} \ na_n = 0$ and $f(x) = 0(1)$, then

$$\operatorname{Osc.}_{n \to \infty} s_n = \operatorname{Osc.}_{x \to 1} f(x)$$

S. M.

27. **Rajagopal, C. T.**—Convergence Theorems for series of positive terms. *Jour. Ind. Math. Soc.*, N.S., III, No. 3, pp. 118–125, (1938).

This paper brings together certain theorems which are able to settle the convergence or divergence of $\sum^{\infty} a_n$, $(a_n > 0)$ with the help of a suitably chosen integral

$$\int^{\infty} F(x)\, dx, \quad F(x) > 0.$$

A. C. B.

28. **Samuels Lall, P.**—Certain modifications of Dedekind's Theorem of Continuity. *Proc. Nat. Acad. Sci., India*, VIII, p. 71, (1938).

It is shown that Mahajani's modification of the treatment of irrational numbers ('Lessons in Elementary Analysis', 1934) is implied in Bromwich's modification ('Introduction to the Theory of Infinite Series', 1926), and that both are deficient, inasmuch as it is required in their modification that the lower class should have no greatest and the upper class no least. It is shown (1) that this condition is not applicable to all sets of irrational numbers, (2) that no problem exists in analysis in which such a division of real numbers can be applied. A variation of the original treatment is suggested which requires only two conditions to establish the set of real numbers, 'order' it, and to prove the theorem of continuity of real numbers.

P. S. L.

29. SASTRY, R. V.—A self-reciprocal function. *Bull. Cal. Math. Soc.*, XXX, Nos. 3 and 4, pp. 87–94, (1938).

30. SEN, D. N.—On the mean-value theorem in Riemann-Stieltje's Integral. *Philosophical Magazine*, Ser. 7, XXVI, (Nov. 1938).

It is well known that the mean-value theorem holds good for Riemann-Stieltje's integral. For the modified Stieltje's integral, as introduced by Pollard in *Q.J.M.*, Vol. XLIX, it was not known whether the theorem was true. The paper establishes the truth of the theorem in the case of modified Stieltje's integral as well.

D. N. S.

31. SHABDE, N. G.—On some formulae involving k_n-functions. *Bull. Cal. Math. Soc.*, XXX, No. 1, pp. 5–8, (1938).

In this paper are obtained some integrals involving k_n-functions, Laguerre functions, and the Hermite polynomials. At the end two formulae are noted, which express the product of two k_n-functions in terms of Legendre polynomials.

N. G. S.

32. SHABDE, N. G.—On some Integrals involving Bessel Functions. *Bull. Cal. Math. Soc.*, XXX, No. 2, pp. 29-30, (1938).

In this paper, certain integrals involving Bessel functions have been obtained. The method employed is that of Operational Calculus.

A. C. B.

33. SHABDE, N. G.—The expansion of a function in a series of associated Legendre functions. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 319-320, (1938).

This paper gives an extension of a theorem by D. P. Banerji (*Proc. Camb. Phil. Soc.*, 34, Part I, 30–32) for cural or toroidal functions to the expansion of an arbitrary function in a series of

$$P^{m}_{-\frac{1}{2}+pi}(\cosh\psi) \text{ or } P^{m}_{n-\frac{1}{2}}(\cos\theta).$$

N. G. S.

34. SHABDE, N. G.—On some results involving k_n-functions. *Journ. Ind. Math. Soc.*, III, No. 4, pp. 146–151, (1938).

In this paper an infinite integral involving several k_n-functions is first noted. From this result various known results can be derived as particular cases. Several integrals involving k_n-functions and Bessel functions are also given and at the end formulae are given expressing the product of more than two k_n-functions in terms of Laguerre-functions and k_n-functions.

N. G. S.

35. SHARMA, J. L.—On Whittaker's Confluent Hypergeometric Functions. *Phil. Mag.* Ser. 7, XXV, (March, 1938).

Several Integrals involving Whittaker's confluent hypergeometric functions have been evaluated. Various other properties are investigated by Operational Calculus. Several series involving W- and M-functions have been summed up. Various recurrence formulae are established. Finally some properties of the zeros of Whittaker's functions are stated.

J. L. S.

36. **Sharma, J. L.**—An integral equation for Whittaker's Confluent hypergeometric functions. *Jour. London Math. Soc.*, XIII, (1938).

An integral equation satisfied by Whittaker's function has been investigated and from this various integral equations are deduced which are satisfied by Parabolic Cylinder functions and Bateman's *k*-function.

J. L. S.

37. **Shastri, N. A.**—On some results involving Bateman's Function. *Journ. Ind. Math. Soc.*, N.S., III, No. 1, pp. 8–18, (1938).

In this note a number of results involving *K*-functions have been put together. In all cases, methods of Operational Calculus have been used to obtain the results.

A. C. B.

38. **Srinivasiengar, C. N.**—On the zeros of Weierstrass's non-differentiable function. *Journ. Ind. Math. Soc.*, N.S., III, No. 3, pp. 114–117, (1938).

Some special characters of the set of zeros of Weierstrass's non-differentiable function have been investigated.

A. C. B.

39. **Subha Rao, H. S.**—Eulerian parameter and Lorentz transformations. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 339–342, (1938).

In this paper, the author has considered an extension of the Eulerian parameters to the problem of four-dimensional rotations, and brought out the connection of these generalised parameters to the spinor calculus arising from Dirac's relativistic theory of the electron.

A. C. B.

40. **Suryanarayan, K. S.**—On three rational functions on a Riemann surface. *Journ. Ind. Math. Soc.*, N.S., III, No. 2, pp. 56–67, (1938).

The author summarised the known theory of the relative auto-morphisms of any algebraic extension of a fundamental corpus and applied the result to the corpus of rational functions on a Riemann surface, considered as an algebraic extension of corpus $K(Z)$. He also proved a few theorems and considered some applications.

A. C. B.

41. **Thiruvenkatachar, V. R.**—Note on Harmonic functions. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 227–236, (1938).

In this paper, results analogous to those of Blaschke and Saks have been obtained for solutions of Poisson's equation and also of the euqation $V^2u+Cu=0$.

A. C. B.

42. **Verma, R. S.**—Some infinite integrals involving Weber's parabolic cylinder functions. *Journ. Ind. Math. Soc.*, N.S., III, pp. 25–33, (1938).

In this paper, the values of the following integrals are investigated:

$$\int_0^\infty x^{l-1}\, e^{-\frac{1}{2}x}\, L_n^h(x)\; W_{k,m}(x)\, dx$$

$$\int_0^\infty x^{l-1}\, e^{-\frac{1}{2}r}\; {}_1F_2(\alpha;\ \beta, 1;\ -xu)\; W_{k,m}(x)\, dx$$

$$\int_0^\infty x^\delta e^{-\frac{1}{4}x^2\left(1+\frac{1}{2y^2}\right)} D_\mu(x) I_{\frac{1}{2}n}\left(\frac{x^2}{8y^2}\right) dx$$

and
$$\int_0^\infty x^\delta e^{-\frac{1}{4}x^2} D_\mu(x) J_n(\sqrt{2xt}) I_n(\sqrt{2xt})\, dx.$$

R. S. V.

43. **Verma, R. S.**—On Laguerre Polynomials which are self-reciprocal in the Hankel Transform. *Journ. Ind. Math. Soc.*, N.S., III, pp. 54-55, (1938).

The function

$$\phi(x) = x^{2m+\mu+\frac{1}{2}} e^{-\frac{1}{4}x^2} L_\mu^m\left(\frac{1}{2}x^2\right)$$

is self-reciprocal or skew self-reciprocal in the Hankel transform of order $\mu+2m$ according as μ is even or odd. This theorem is proved by the help of an integral evaluated in the first paper.

R. S. V.

44. **Verma, R. S.**—A pair of functions which are Fourier Sine-transforms of each other. *Quarterly Journ. Math.*, IX, pp. 203–205, (1938).

In this paper, with the help of the lemma,

$$T_m^n(x) - \frac{n+1}{2} T_m^{n+1}(x) + \frac{1.3.(n+1)(n+2)}{2.4} T_m^{n+2}(x) - \ldots = \frac{1}{\sqrt{x}} T_{m-\frac{1}{2}}^n(x),$$

it is proved that if

$$\phi(x) = i\left\{D^2_{-(n+1)}(ix) - D^2_{-(n+1)}(-ix)\right\}$$

and

$$\psi(x) = (-)^n \frac{2\pi}{n!} e^{-\frac{1}{2}x^3} L_n(x^2),$$

then $\phi(x)$ and $\psi(x)$ are Fourier sine-transforms of each other provided that n is a positive integer.

R. S. V.

ASTRONOMY AND COSMOGONY.

45. **Ganguly, H. K.**—On Keplerian orbits in the field of a Nucleus Radiating Mass. *Bull. Cal. Math. Soc.*, XXX, No. 2, pp. 35-44, (1938).

The motion of a heavenly body in the field of a massive nucleus which is losing mass by radiation is discussed. If m is the mass of the nucleus at any moment the law

$$\dot{m} = -\alpha m^3$$

has been assumed where α is a constant. The conclusions from the above law have been worked out for comparison with the results of Jeans set forth in his 'Astronomy and Cosmogony'.

The author points out that for different laws of mass the quasi-elliptic character will be lost at quite different rates, but in the case of the particular law mentioned above, an orbit once quasi-elliptic always remains so.

A. C. B.

46. **Samuels Lall, P.**—The Southern Stream and the K term. *M.N.R.A.S.*, XCIX, p. 42, (1938).

The *K*-term for B type stars is calculated to be 4·2 km/sec. The 'local' value of *K* for the 'Southern Stream' area for B type stars has also been determined independently

of the stream as such by two methods and found to be 7·2 km/sec. The 'Red shift' of Einstein for these stars is taken as 1·4 km/sec. The convergent of the 'southern stream' has been found for values of *k* lying in the interval $0 \leq k \leq 10$ km/sec. Then by a 'trial and error' process the *most probable* position of the convergent and the value of *k* has been found. This coincides with the mean of Kapteyn's position and of Plaskett and Pearce's position, corresponding to $k = 7 \cdot 2$ km/sec. The value of *k* thus coincides with the 'local' value of *k*, and the convergent with the solar anti-apex. It comes out incidently also that 4·2 km/sec. is the more probable value of *k* for the B type stars than Plaskett and Pearce's value of 1·6 km/sec.

P. S. L.

47. SEN, N. R.—Two Elementary Theorems on Polytropes. *Bull. Cal. Math. Soc.*, XXX, No. 1, pp. 11–16, (1938).

Two theorems on equilibrium configurations of polytropic gaseous masses have been considered.

A. C. B.

GEODESY.

48. BOMFORD, G.—Readjustment of the Indian Triangulation. *Survey of India Professional Paper*, No. 28, (1938).

Reports the completion of a new adjustment of the Indian Geodetic triangulation, in which use is made of the base lines and Laplace stations recently observed. The probable errors are discussed, and the advantages of using the new adjustment when a change from the Everest to International spheroid can be carried out.

G. B.

49. CRONE, D. R.—Deviation of the Vertical. *Geodetic Report, Survey of India*, 1938. Chapter III, pp. 16–18, three charts.

Reports the completion of a line of astronomical observations, providing a section of the geoid North and South through Burma. The geoidal rise in Southern Burma is confirmed. A chart shows the results.

D. R. C.

50. GLENNIE, E. A.—Gravity. *Geodetic Report, Survey of India*, 1938. Chapter IV, pp. 26–40, five charts.

Reports the results of gravity observations made by Mr. M. N. A. Hashmie, B.A., in Baluchistan, Rajputana, the Punjab, and Delhi. The area of marked gravity defect in Baluchistan is not closely restricted to the Quetta-Sibi-Kalāt area as previously shown. In the Punjab and Rajputana, whilst the new work makes considerable changes in detail to the contours of gravity anomalies shown in Geodetic Report 1937, the main conclusions remain unchanged. The supposed buried Shahpur-Delhi ridge now appears to curve round southwards joining the Aravalli line north-east of Ajmer instead of near Delhi. It is admitted however that the situation in this area is very complex, and requires more detailed gravity work.

A contoured chart of subsoil water levels in the Punjab and Rajputana is given amplifying chart XV in Geodetic Report 1936. The Bikaner and Southern Punjab area appears to be a great sink into which subsoil water from the North and East is flowing with only a very narrow outlet to the South.

E. A. G.

51. GULATEE, B. L.—Magnetic anomalies. *Survey of India Professional Paper*, No. 29, (1938).

Formulae for magnetic anomalies produced by induced magnetism in different forms of magnetic deposits are given. The variations of these anomalies for traverses along different azimuths have been shown graphically for different depths of the deposits, taking the numerical value of the earth's magnetic force as 50,000γ.

B. L. G.

52. **Gulatee, B. L.**—Gravity reductions and the figure of the Earth. *Gerl. Beit. 2, Geoph.*, LIII, pp. 323-336, (1938).

The accuracy of the various formulae for deducing the rise of the natural geoid with respect to its reference spheroid from the gravity anomalies is considered. The merits and demerits of the various reductions for reducing observed gravity from ground level to geoidal level for the above purpose are discussed.

B. L. G.

GEOMETRY.

53. **Auluck, F. C.**—On Conics connected with four or more lines. *Proc. Ind. Acad. Sci.*, VII, No. 1, (January, 1938).

T_p is defined as the Conic passing through a point P and the feet of the perpendiculars from it on four given lines. The locus of P consists of the four lines themselves and another line or a circle according as the slopes of the axes of T_p are fixed or the product of the tangents of the angles made by its asymptotes with a given line is constant. Some other allied results are also given.

F. C. A.

54. **Auluck, F. C.**—The Volume of a Tetrahedron, the area of the faces being given. *Proc. Ind. Acad. Sci.*, VII, No. 4, (April, 1938).

It is shown that the volume is indeterminate. The volume has an upper bound but no lower bound. A method is indicated for finding the stationary values of the volumes.

F. C. A.

55. **Bagchi, Haridas**—Vector Theory of affine transformations. *Bull. Cal. Math. Soc.*, XXX, No. 2, pp. 45–72, (1938).

In this paper the author has discussed by vector methods the general theory of affine transformations in Euclidean space of three dimensions. The affine transformability of any two *allied* quadrics has been studied in detail. The *kinship* subsisting between an affine transformation and a homogeneous strain has also been treated briefly.

A. C. B.

56. **Durairajan, N.**—The Meta-deltoid. *Mathematics Student*, VI, No. 4, pp. 151–154, (1938).

Some properties of the meta-deltoid have been investigated.

A. C. B.

57. **Ghosh, N. N.**—New methods in the Geometry of Hyperspace. *Bull. Cal. Math. Soc.*, XXX, No. 2, pp. 73–84, (1938).

In this paper the author has illustrated the application of the scalar determinants in the geometry of hyper-space. The topics chosen herein relate to curves in general lying in a linear space. The process followed is essentially vectorial and as it hinges upon an elementary basis has no direct reference to the tensor calculus.

A. C. B.

58. **Iyengar, K. S. K.**—A note on Narsinga Rao's problem relating to tetrahedra. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 269–278, (1938).

59. **Iyengar, K. S. K.** and **Iyengar, K. V.**—On a problem relating to a tetrahedron. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 305–311, (1938).

The authors have solved the problem of determining the tetrahedron of maximum volume, the areas of whose faces are given. It is found that the maximum is attained when the tetrahedron is orthogonal. The authors have further proved that in the case of n dimensions there is only one such orthogonal simplex, with assigned values for the $(n-1)$ dimensional volumes of its face-simplexes. An isoperimetrical problem of Steinitz is also solved by the above methods.

A. C. B.

60. **Nagabhushanam, K.**—On curves minimising a certain integral. *Math. Student*, VI, No. I, p. 22, (1938).

If g_{ik} be the metrical ground-form of Euclidean 3 space, the tensor

$$G_{ik} = x^r x^s \left(g_{rs} g_{ik} - g_{ri} g_{sk}\right)$$

is degenerate, and the curves which minimise the integral

$$\int \left(G_{ik} dx^i dx^k\right)^{\frac{1}{2}}$$

are straight lines through the origin. These null extromals are the only curves in the solution. This can be physically interpreted in terms of the moment of intertia of a body.

K. N.

61. **Narsinga Rao, A.**—Studies in Turbine Geometry. *Journ. Ind. Math. Soc.*, N.S., III, No. 3, pp. 96–108, (1938).

This paper is devoted to the creation of necessary concepts required for the building up of what promises to be an important extension of circle and sphere geometries with the help of a fruitful idea due to Prof. Edward Kasner—the Turbine. The author has changed somewhat the significance of this term so that the two-dimensional turbine may have the same features as its confreres in higher space and Kasner's turbine is here called a 'Semi-turbine', since two of them go to make up a turbine, according to the author's terminology.

A. C. B.

62. **Narasinga Rao, A.** and **Venkataraman, B. R.**—The Infinitesimal Flow on the Projective plane. *Journ. Annamalai University*, VII, No. 3, (1938).

In this paper, the velocity field V due to the infinitesimal transformations of the projective group in the plane is studied and some of these results are extended to a Euclidean space of n dimensions. It is shown that the locus of points at which Div V is constant is a system of parallel lines and the locus of points at which Curl V is constant is another system of parallel lines perpendicular to the former. O being the point at which both the divergence and curl of the field vanish and L, L' the lines along which the divergence and curl respectively vanish it is shown that the field vector V is composed firstly of a velocity due to a pure translation. Secondly, a velocity due to a homogeneous strain of zero divergence and zero rotation and lastly a radial flow in which each point P has a velocity along OP.

N. R.

63. **Ramamurti, B.**—A special net of quadrics. *Proc. Ind. Acad. Sci.*, IX, pp. 316–321, (1938).

The special net of quadrics obtained by taking the polar quadrics of the points of a plane with respect to a cubic surface has been studied by Edge (*Proc. Edin. Math. Soc.*, 1936, pp. 185–209). It is known that such a net arises in the same manner from ∞^2 cubic surfaces. The object of the paper is to establish the above results, and the generalisation of Edge in [n], by the method of binary apolarity. Further by making use of a result proved by the author in a recent paper (*Math. Annalen*, 1935, 582–586), the exact structure of the ∞^2 system of cubic surfaces is obtained. This enables us to explain the discrepancy between the values 18 of Töpletz and the value 14 of Edge obtained for the degree of one of the parameters of the system, and to point out that the really significant value is the minimum value which is 4.

B. R.

64. **Ramamurti, B.**—On Linear Complexes of minimum rank containing all the tangents of a rational norm curve. *Journ. Ind. Math. Soc.*, N.S., III, No. 1, pp. 34–40, (1938).

Certain interesting results on linear complexes of the lowest rank which contain the tangents of R^n have been obtained.

A. C. B.

65. **Ramamurti, B.** and **Srinivasiengar, C. N.**—The lines of striction on a quadric. *Journ. Ind. Math. Soc.*, N.S., IIII, No. 1, pp. 19–24, (1938).

In this paper, the metrical specialisations consequent to the metrical definition of the line of striction and a few allied problems are considered. A. C. B.

66. **Ram Behari**—Infinitesimal deformation of ruled surfaces. *Jour. Ind. Math. Soc.*, New Series, III, pp. 68–72, (1938).

First, the general problem of infinitesimal deformation of any surface has been dealt with and then the results have been applied to the case of a ruled surface. R. B.

67. **Ram Behari**—Comparison of Sannia's theory of Line Congruence with Gauss's Theory of Surfaces. *Journ. Ind. Math. Soc.*, New Series, III, pp. 109–113, (1938).

Some analogies between the theory of line congruences and Gauss's theory of surfaces have been noted by Kummer and Sannia. In this paper some other similarities between the two theories have been pointed out. R. B.

68. **Venkataraman, B. R.**—Inequalities connected with a Tetrahedron. *Mathematics Student*, VI, No. 2, (1938).

The main result of this paper may be stated thus: 'The in-radius of a tetrahedron is less than or equal to a third of its circumradius, the equality holding only when the tetrahedron is regular'. The proof is based on theorems of maxima and minima relating to surfaces and volumes of tetrahedra. One other inequality is obtained relating to the volume and surface area of a tetrahedron which is found to be sharper than an inequality obtained by Schwarz which is however applicable for all convex solids. B. R. V.

HISTORY OF MATHEMATICS.

69. **Madhava Rao, B. S.**—Names in Mathematics. *Intermediate College Magazine, Bangalore*, V, p. 59, (1938).

The peculiarity of the use of common names to denote profound mathematical notions is illustrated in a popular way. Also the use of well-known phrases and corresponding concepts from the domain of quantum theory, invariant theory and topology are brought out. B. S. M. R.

70. **Singh, A. N.**—Hindu Mathematics. *Science and Culture*, III, pp. 521–527, 579–585, (1938).

In these articles a survey of Hindu achievements in Arithmetic, Algebra, Geometry, Trigonometry, Calculus, etc. is given from the earliest known times up to the 15th century. A. N. S.

MATHEMATICAL PHYSICS.

71. **Auluck, F. C.**—A Note on Longitudinal waves in Degenerate Gas. *Science and Culture*, III, No. 12, p. 682, (1938).

Expressions for velocity of longitudinal waves in a degenerate and non-degenerate gas are found out and then an application is made to find the central density of the earth. F. C. A.

72. **Banerji, A. C.** and **Bhatnagar, P. L.**—On the Intensity of Ionization in the Earth's atmosphere. *Ind. Journ. Physics*, XII, Part VI, pp. 387–398, (1938).

Chapman has calculated the rate of ion-production and absorption of radiation in the earth's atmosphere assuming that isothermal condition prevails throughout the atmosphere and that the temperature is constant throughout. In spite of the fact that ionised layers are formed at a height 300 kms. and above, he has totally neglected the variation of gravity even at such heights. It is known that up to 11 kms. above the sea-level the atmosphere is in adiabatic state. It has been found by recent observers that between 40 kms. and 60 kms. above sea-level there is a positive temperature gradient and between 60 kms. and 82 kms. there is a marked decrease of temperature. Between 82 kms. and 300 kms. above sea-level, temperature increases more or less linearly with height.

In the present paper the atmosphere has been divided into three regions, viz.:—

1. From 82 kms. to 300 kms. above sea-level in which the temperature is taken to increase linearly with the height and the variation of gravity has been taken account of.
2. From 11 kms. to 82 kms. above sea-level in which, in spite of the abnormalities of temperature between 40–82 kms., the temperature has been assumed to be constant and equal to its mean value 260° absolute in order to avoid complications in mathematical analysis.
3. Adiabatic region from sea-level to 11 kms. above sea-level.

For each of the regions the formula for the intensity of ionization has been found.

A. C. B.

73. **Biswas, B. N.**—Statistics of photons and Planck's Radiation Formula. *Journ. Ind. Math. Soc.*, N.S., III, No. 3, pp. 82–86, (1938).

In this paper, the statistics of photons has been developed to derive Planck's Radiation Formula on the line already evolved by Biswas and Sen in a previous paper by introducing the idea of discontinuity in phase space.

A. C. B.

74. **Madhava Rao, B. S.**—Bemerkungenzur Ringstrutur des Elektrons. *Phys. Zs.*, 30 Jahrganj, Heft 5, p. 187, (1938). Antwort auf Starks Bemerkungen. *Ibid.*, p. 193.

It is shown that Stark's recent attempts to formulate a theory of ring electron lead to contradictions, and are physically untenable. In the second paper a reply is given to Stark's remarks on the first paper by the author.

B. S. M. R.

75. **Madhava Rao, B. S.**—Question of invariance in the neutrino-theory of light. *Proc. Ind. Acad. Sci.*, VII, No. 4, p. 293, (1938).

The neutrino theory of light developed by Jordan and Kronig sets up a relation between the neutrino operators and the photon operators such that while the former satisfy the commutation laws pertaining to the Fermi-Dirac statistics, the latter satisfy those of Bose-Einstein statistics. The question of Lorentz-invariance of this fundamental relation connecting the two sets of operators is examined in this paper, and it is shown by considering rotations of the frame of reference that the relation itself is not Lorentz-invariant.

B. S. M. R.

76. **Madhava Rao, B. S.**—Biquaternions in Born's Electrodynamics. *Proc. Ind. Acad. Sci.*, VII, p. 333, (1938).

This paper is concerned with a type of complex representation by biquaternions given by Watson for the case of Born's original field theory. It is shown that many of Watson's results follow at once from the results in a previous paper on general complex representations. It is also proved that it is possible to set up biquaternion representations corresponding to Born's action function in the generalised Infeld form as a sum of Lagrangian and Hamiltonian. Finally a biquaternion representation of the fundamental parameters introduced by the author in the generalised action function theory is also given.

B. S. M. R.

77. **Narsinga Rao, A.**—Through a Railway Window. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 156–161, (1938).

The object of this note is to describe in the language of Mathematics the apparent twisting and writhing of a landscape as seen by a moving observer.

A. C. B.

78. **Prasad, K.** and **Sen, D. N.**—On the Trajectory of Ash Particles in Air and the Determination of their size. *Philosophical Magazine*, Ser. 7, XXV, Suppl. (June, 1938).

The paper deduces theoretically the form of trajectory described by tobacco ash particles from a lighted cigar in air under a known driving pressure. An expression for the average size of the particles has also been obtained.

The jet has been photographed under very steady conditions and actual measurements verify exceedingly well the theoretical relation obtained. The average size of the particles calculated agrees well with previous values as far as known. Very interesting applications of this new method have been indicated.

D. N. S.

MECHANICS.

79. **Bagchi, Haridas.**—Vector theory of Non-coplanar forces. *Bull. Cal. Math. Soc.*, XXX, Nos. 3 and 4, pp. 105–146, (1938).

In this paper the author has investigated the theory of non-coplanar forces acting on a rigid body from the standpoint of Vectorial Geometry. In order to pave the way for a systematic treatment the paper is sub-divided into five sections; Sec. I deals with diverse modes of reduction of a force-system with a short digression on a certain related affine transformation. Sec. II is devoted to a general discussion of systems of rays and of systems of forces in equilibrium. Sec. III disposes of the theory of conjugate lines of a force-system with an incidental reference to a cognate theory of conjugate curves and conjugate ruled surface. Sec. IV treats of the linear complex made up of the set of nul lines, and gives prominence to the connecting link between a linear line-complex and the complex of nul line of a force-system. Sec. V is concerned chiefly with the quadratic complex which is formed by the axes of principal moment of an arbitrary system of forces.

A. C. B.

80. **Chowdhury, A. C.**—Affine rolling of the first kind. *Bull. Cal. Math. Soc.*, XXX, Nos. 3 and 4, pp. 147–167, (1938).

In this paper the author has discussed affine rolling and has shewn that this motion has at every instant a line of points having no velocity and a point having no acceleration. Conversely an affine motion whose lines of points with no velocity envelop a curve free from points of inflexion and possessing affine arc and curvature can be represented as an affine rolling of this curve on a second one.

A. C. B.

81. **Sen, B.**—Direct Determination of Stresses from the Stress Equations in some two-dimensional Problems of Elasticity. Part I. *Phil. Mag.*, Series 7, XXVI, pp. 98–119, (1938).

It is shown in this paper how for certain plane strain problems of elastic solids with curved as well as plane boundaries, stresses can be directly deduced without using Airy's function. Values of stresses being prescribed on the boundaries, problems are reduced to boundary value problems of the theory of potential, and as such the results are expressed either in infinite series or in definite integrals. By using complex variables the solution is occasionally made simpler and more compact. It has also been shown in this paper that the method indicated therein can be used with advantage in a wide range of problems including those of 'generalized plane stress'.

B. S.

82. Sen, D. N. and Kumar, R.—Motion of a Vibrating String loaded at several points. *Bull. Calcutta Math. Soc.*, XXX, No. 1, (1938).

The paper discusses the motion of a string loaded symmetrically at n points and deduces results about the frequencies of normal modes. An equation is obtained in terms of a continuant, the roots of which are obtained. It has been proved theoretically how the loading diminishes the frequencies of normal modes except those of order $k(n+1)$. It has been also proved that the disturbed frequencies may be made to approach the undisturbed ones by suitable loading.

D. N. S.

83. Seth, B. R.—Transverse waves in canals. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 104–107, (1938).

The result obtained in an earlier paper (*Phil. Mag.*, 24 (1937), pp. 288–293) that no exact stable type of transverse waves can exist in a circular canal has been generalized, and it has been shown that it can be extended to canals whose section is a closed curve. In certain cases an approximate value of the frequency can be obtained, and this value approaches $(g/\rho)^{\frac{1}{2}}$ as the depth becomes very small, ρ being the radius of curvature at the lowest point.

B. R. S.

RELATIVITY.

84. Mukerji, B. C.—Two cases of Exact Gravitational Fields with axial symmetry. *Bull. Cal. Math. Soc.*, XXX, Nos. 3 and 4, pp. 95–104, (1938).

Gravitational fields due to (1) an infinite straight wire carrying a constant electric wire, and (ii) the field of an electrically charged infinite straight wire have been studied. In both cases the field is the combined one due to the matter of the wire, and the current or charge on the wire. The solution in each case is exact.

A. C. B.

85. Nagabhushanam, K.—Variational principle in a non-kinematical case of Milne's Expanding Universe. *Math. Student*, VI, No. 1, p. 23, (1938).

For the symmetric 4-dimensional equations of trajectories in Milne's Expanding Universe as given by Kosambi, the tensors P^i_j and R^i_{jk} for general $G(\xi)$ are evaluated and given; and it is found that for $G(\xi) = C$, a constant not equal to -1, no regular metric exists, just as in the case of $G(\xi) \equiv -1$.

K. N.

STATISTICS (APPLIED).

86. Acharya, D. P. and Mahalanobis, P. C.—A note on the correlation between results in the College and University examinations. *Sankhya*, III, pp. 239–244, (1938).

The paper discusses the correlation between the results of the Intermediate examination in Arts and in Science of the Calcutta University and the marks obtained in the College Examinations for five batches of students of an affiliated college for the five academic sessions 1928–30 to 1932–34. There is a high correlation (about + 0·85) between marks in the Annual Examination taken at the end of the first year, and the Test examination taken at the end of the second year. The correlation ratio for marks in the College examinations and results in the University examinations is statistically significant in every case.

D. P. A.

87. **BOSE, S. S. and MAHALANOBIS, P. C.**—On an Exact Test of Association between the occurrence of Thunderstorm and an Abnormal Ionisation. *Sankhya*, III, pp. 249–252, (1938).

In testing independence with 2 × 2 tables, if the frequencies are small, the $P(\chi^2)$ test, in general, gives underestimated probabilities. The exact test is based on an expression involving the hypergeometric series. The application of this exact test to some data collected by J. N. Bhar and P. Syam relating to the occurrence of thunderstorms and the ionisation of the Kennelly-Heaviside layer near Calcutta shows that a significant association exists between the occurrence of thunderstorms and abnormal ionisation in the upper air; but there is no appreciable connexion between magnetic disturbances and abnormal ionisation or between magnetic disturbances and thunderstorms. S. S. B.

88. **BOSE, S. S. and MAHALANOBIS, P. C.**—On estimating individual yields in the case of Mixed-up yields of two or more plots in Field Experiment. *Sankhya*, IV, pp. 103–120, (1938).

The principle developed by F. Yates for estimating the yields of missing plots has been used in the present paper to obtain the solution of the problem of reconstructing the yields of plots from a knowledge of the total yield of the plots. The relevant formulae for various cases relating to randomized block and Latin Square lay-outs have been given with numerical illustrations based on agricultural data, while the proof of the mathematical expression has been given in the Appendix by S. S. Bose. S. S. B.

89. **DATTA, B. N. and MAHALANOBIS, P. C.**—A Note on the foot and stature correlation of certain Bengal castes and tribes. *Sankhya*, III, pp. 245–248, (1938).

The note is based on measurements of length and breadth of foot and stature of 113 adult males from different parts of Bengal. The subjects belong to a number of different castes which may be considered fairly representative of Bengal. The upper castes have a higher stature and a smaller foot-length and foot-breadth than the lower castes. There is a correlation of + 0·45 between foot-length and foot-breadth, a correlation of + 0·32 between foot-length and stature and practically no correlation between stature and foot-breadth. B. N. D.

90. **MAHALANOBIS, P. C.**—A Note on the Influence of Lunar Phase on the Rainfall in the month of July in Calcutta, 1878–1924. *Sankhya*, III, pp. 233–238, (1938).

A statistical analysis of the rainfall data in the month of July in Calcutta conducted for the metoonic cycles covered by the period 1878–1924 did not show any appreciable differences between the intensity of rainfall on different lunar days. Differences in rainfall between years or between two meteonic cycles were also insignificant. The rainfall in the dark phase was however significantly greater than the rainfall in the bright phase in both the meteonic cycles and also for the whole period of 47 years. P. C. M.

91. **MAHALANOBIS, P. C.**—A Statistical Report on the Experimental Crop Census of 1937. (*Indian Central Jute Committee*, 1938).

The official forecasts of annual jute production in Bengal are well known to be defective owing to the inaccuracy in the estimate of area under jute. With a view to improve the accuracy of the area factor, the Indian Central Jute Committee at its first meeting in February 1937, decided to undertake a complete census of the area under jute. The work was to be spread over five years, blocks of roughly one-fifth of the whole area being completed every year. For reasons explained in various notes to the Jute Committee, the author strongly advocated a small scale experiment to collect primary material for ascertaining:—

(1) The cost and accuracy of a complete census of all the plots in the area under survey;

(2) The cost and accuracy of estimates by a sample survey using different methods of sampling, and for

(3) Studying the sampling technique by model experiments in the laboratory based on the complete enumeration of selected areas.

The proposal for an experimental crop census was approved and a grant of Rs.10,000 was sanctioned for this purpose by the Indian Central Jute Committee on the 14th August, 1937.

Two thanas, Deganga in 24 Parganas and Tarakeswar in Hooghly, were selected for the work. Besides the jute crop area under other crops like Aman and Aus paddy, sugarcane, and other crops were recorded for each plot. But the present report deals only with the data relating to the jute crop.

The general conclusions are:—

(1) A complete census of all plots under jute in one year will be expensive and the total cost will lie between twelve and fifteen lakhs of rupees. The difficulties of the organization will be very great.

(2) Even if a complete census can be carried out in practice, the result will be unreliable, and the margin of error in the case of thanas will be of the order of fifty per cent, so that detailed information about lots and *Mauzas* will be entirely useless for administrative purposes.

(3) A census spread over five years will cost about three lakhs of rupees per year but the results will be of no value. Owing to marked seasonal fluctuations in weather conditions, wide variations are known to occur in the area under jute from year to year. In a divided census the information gathered in different seasons under widely varying conditions will not be comparable.

(4) A sample survey is practicable; and is likely to give, after the technique is properly developed and the necessary organization is built up, results of reasonable accuracy with a marginal error of the order of two or three per cent in the estimate for the whole province with an annual expenditure of about two lakhs of rupees.

P. C. M.

92. Mahalanobis, P. C.—A Note on Grid Sampling. *Science and Culture*, IV, No. 5, (1938).

In field surveys, the sampling units or grids usually have definite spatial connexions. In a purely random field such connexions are absent, and the sampling variance (ignoring boundary conditions) conforms to the binomial distribution. In other cases, analysis of data collected in the course of certain recent crop surveys (again ignoring boundary conditions) shows a more generalized type of distribution, in which the variance is inversely proportional to a constant power of the size of the sampling unit. This result enables the field characteristics being defined with the help of two parameters.

The efficiency of a sampling programme depends on two factors, namely the magnitude of the sampling error and the total cost or time necessary for the sampling work. The result given in the previous paragraph determines the sampling error. The second factor can be studied by constructing suitable cost functions which depend on the size of the sampling units as well as on their density. The efficiency of sampling can then be suitably defined in terms of the variance function and the cost function. Maximizing this expression in the usual way, it is finally possible to determine the most efficient sampling programme for a given expenditure for different types of field.

P. C. M.

93. Sinha, A. R.—A study of the Indian Official Jute Forecast. *Sankhya*, III, pp. 413–420, (1938).

Based on indirect estimates of the 'actual crop' the author shows that the forecast estimates have a definite bias towards under-estimation (14%) and that there is no clear evidence to show that the forecast has improved in accuracy with the passage of time.

Of the two basic elements of jute forecasts, namely: (i) the area, and (ii) the average yield per acre, the fault appears to lie mostly with the area factor.

A. R. S.

94. **SUKHATME, P. V.**—An application of the bi-partional function H_g (P, Q) in the enumeration of different samples from finite population. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, p. 8, (1938).

In this paper, the author has exhibited the application of the bi-partional function H_g (P, Q) in the enumeration of different samples of given size drawn from a finite population.

A. C. B.

STATISTICS (THEORETICAL).

95. **BOSE, R. C.**—On the Distribution of the Means of Samples drawn from a Bessel Function population. *Ind. Journ. Statistics*, III, Part 3, pp. 262–264, (1938).

S. Bose has made a critical study of the following Bessel function distribution:—

$$f(x)dx = c\,e^{-\alpha x} \,.\, x^{m/2} \,.\, I_m(q\sqrt{x})\,dx$$

where

$$c = (2/q)^m \alpha^{m+1} e^{-q^2/4\alpha}, \text{ and } q \geqslant 0,\ \alpha \geqslant 0,\ m > -1.$$

This distribution first arose in a specialized form in connection with the researches of the present author on the exact distribution of the D^2-statistics. In the present paper the distribution of the mean, of a random sample of n, from this population is found. It comes out as

$$C' e^{-n\alpha\bar{x}} \,.\, \bar{x}^{(mn+n-1)/2} \,.\, I_{mn+n-1}(nq\sqrt{\bar{x}})\,d\bar{x}$$

where

$$C' = (2/nq)^{mn+n-1} \,.\, (n\alpha)^{n(m+2)} \,.\, e^{-nq^2/4\alpha}.$$

Hence the distribution of the mean is of the same type as the mother population. Since the type III distribution is a special case of the distribution investigated here, Irwin's distribution of the mean of a random sample of n from a type III population follows as a corollary.

R. C. B.

96. **BOSE, R. C.**—On the Application of the properties of Galois Fields to the Problem of Construction of Hyper-Graeco-Latin Squares. *Ind. Journ. Statistics*, III, Part 4, pp. 323–338, (1938).

By using the properties of the Galois Field GF_{p^n}, it is possible to build up a projective geometry with $S^2 + S + 1$ points, and $S^2 + S + 1$ lines, where $S = p^n$, p being a prime integer, and n any positive integer. It has been shown that the existence of such a geometry is exactly equivalent to the existence of an s-sided completely orthogonalised Hyper-Graeco-Latin square. This completes the proof of the existence of such a square when the number of elements in each row is a prime or a power of a prime. The actual form in which the Hyper-Graeco-Latin square will be obtained depends on the manner of identification of the lines forming the pencils defining the co-ordinates of the points of our geometry, and the elements of the Galois-Field. When $n = 1$, i.e. S is a prime, a certain simple mode of identification is shown to lead to the usual method of construction of Hyper-Graeco-Latin square of this special type. When however $n > 1$, so that s is a power (other than 1) of a prime, it is shown that there exists a certain method of identification, for which the component Latin squares, of the completely orthogonalised Hyper-Graeco-Latin square, are all derivable from one of them, called the Key Latin square itself can be generated from the row number one, according to simple rules. Thus the actual labour of construction is considerably simplified. Actual cases in which $S = 4$, 8, 9, 16, 25 or 27 have been discussed.

R. C. B.

97. **BOSE, R. C.** and **ROY, S. N.**—The Distribution of the Studentised D^2-statistic. *Ind. Journ. Statistics*, IV, Part 1, pp. 19–38, (1938).

The problem of discrimination between and classification of different populations is insistent in various sciences. The case of multi-variate normal populations supposed to be identical in sets of variances and covariances but different from one another in sets of means is physically the most important one. The populations have of course to be judged in the light of samples supposed to have been drawn from them. In this paper this problem is tackled by defining and obtaining the sampling distribution of a certain statistic which is called the D^2-statistic. The sampling distribution is obtained by the use of hyperspace geometry and the use of a certain class of co-ordinates introduced by the authors in an earlier paper of theirs (*Sankhya*, Vol. 3(1), 1937, pp. 1–40). The distribution involves a modified hyper-geometric function of D^2, together with a much simpler function and involves further the population parameters in only a certain expression Δ^2 which is the exact population analogue of D^2 for the pair of samples. When the populations tested are identical in sets of means this distribution is found to degenerate into that of Fisher's Taxonomic coefficient indicated by him in an earlier paper (*Annals of Eugenics*, Vol. 7 (2), 1936, pp. 178–188).

R. C. B.

98. Bose, S. S.—On a Bessel Function Population. *Ind. Journ. Statistics*, III, Part 3, pp. 253–261, (1938).

The properties of the following Bessel functions distribution:—

$$df(y) = \text{const.}\ y^{n/2} . e^{-\alpha y} I_n(k\sqrt{y})dy$$

as a graduating frequency curve have been investigated. The moments of the equation have been calculated and its region in the (β_1, β_2) plane indicated. Some well-known distributions have been deduced from it as special cases and, finally, the actual method of fitting a curve has been illustrated as an example.

S. S. B.

99. Bose, S. S.—Relative Efficiencies of Regression Coefficients estimated by the method of Finite Differences *Sankhya*, III, pp 339–346, (1938).

In the problem of fitting a straight line when a single observation of the dependent variable is given at each of n equally spaced values of the independent variable, the author suggests three methods of getting the linear coefficients which he calls (1) method of successive differences, (2) method of differences at half range, and (3) method of range, as alternatives to the classical method of least squares. The sampling variances and efficiencies of those three methods of estimating the linear regression coefficient are compared with those of the estimates obtained by the method of least squares.

S. S. B.

100. Krishna Swami Ayyangar, A A.—On the Semi-invariants of two variates and their additive property. *Journ. Ind Math. Soc.*, N.S., III, No. 1, pp. 1–7, (1938)

This paper is the outcome of an attempt to investigate a general set of statistical constants of the series

$$f(xy) \equiv \sum A_{pq} z^p y^q = \prod_1^n \left\{ f_1(xy) \right\}^{m_i},$$

which can be expressed as the sum of the corresponding constants of the factors. It is proved that such constants are comprised in the linear combinations of Thiele's semi-invariants and the author's generalisations of them, associated with the given distribution.

A. C. B.

101. Nair, K. R.—The Distribution of Krishna Iyer's 'Mean of Fisher's t^2'. *Current Science*, VII, Part 1, pp. 21-22, (1938).

Mr. P. V. Krishna Iyer put forward a statistic which is the mean of all possible t^2 that are obtained while comparing in pairs a set of sample means, the samples containing either equal or unequal number of observations. When the samples are equal in size Mr. Iyer's statistic reduces to Fisher's 'Ratio of variances' and so has the same sampling distribution as the latter. Mr. Iyer claimed, without adequate proof, that for samples of unequal size also, his statistic has the same distribution as that of the ratio of variances.

The author in this paper proves that Mr. Iyer's claim cannot be substantiated, and also emphasizes the fact that his statistic is too cumbrous for numerical calculation, let alone the exact test of its significance which is not available owing to its sampling distribution being unknown.

K. R. N.

102. NAIR, K. R.—On Tippett's 'Random Sampling Numbers'. *Proc. Indian Statistical Conference*, Calcutta, 1938.

In view of the important rôle played by Tippett's numbers in experimental verification and investigation of theoretical sampling distribution of statistical constants, the author attempts an examination of the randomness of these numbers in respect of their application to sampling work from continuous statistical populations. The test of randomness was based on the 'probability integral test', independently developed by R. A. Fisher and K. Pearson, and confined to samples of size 5, 10, and 25. Tippett's numbers were found to satisfy this test of randomness.

K. R. N.

103. NAIR, K. R.—On a Method of Getting Confounded Arrangements in the General Symmetrical Type of Experiment. *Proc. Indian Statistical Conference*, Calcutta, 1938.

Among the symmetrical types of factorial experiments, i.e., of n factors at p levels each in all combinations, confounded designs for the cases $p = 2$ and $p = 3$ have been discussed by Barnard and Yates respectively. Yates has also indicated that the case of $p = 4$, can be deduced from the case $p = 2$.

In this paper the author has tackled the general problem by developing a method of getting confounded arrangements in the p^n type of experiment. The author has discovered that two systems of interchanges are associated with any p-sided Hyper-Graeco-Latin square, so far published. That these two systems of interchanges are the most useful tools in preparing confounded designs have been demonstrated in this paper for $p = 3$ and 4.

It is known that a p-sided Hyper-Graeco-Latin square exists when p is a prime or power of a prime. For all such values of p this method based on the two systems of interchanges will work. In getting balanced set of replications for the purpose of partial confounding, a method has been developed which works only when p is such that $p—1$ also is either a prime or a power of a prime.

K. R. N.

104. ROY, S. N.—A Geometrical Note on the use of Rectangular Co-ordinates in the Theory of Sampling Distributions connected with a multivariate Normal Population. *Ind. Journ. Statistics*, III, Part 3, (1938).

If in a space of any number of dimensions n, p coinitial vectors are given ($i = 1, 2, \ldots p$ and $p < n$) and if the scalar product of any two of them be a_{ij} ($i, j = 1, 2 \ldots p$) then it is shown that the minor of a_{ij} in the determinant $| a_{ij} |$ is equal to $A_i A_j \cos \theta_{ij}$ where θ_{ij} is the angle between the flat F_1 formed by the Vectors $(a_1, a_2, \ldots a_{i-1}, a_{i+1}, \ldots a_p)$ and F_2 formed by $(a_1, a_2, \ldots a_{j-1}, a_{j+1} \ldots a_p)$ and A_i and A_j are respectively the area of the hyper-parallelopipeds formed by $(a_1, a_2, \ldots a_{i-1}, a_{i+1}, \ldots a_p)$ and $(a_1, a_2, \ldots a_{j-1}, a_{j+1}, \ldots a_p)$; it is also shown that minor of a_{ij} in $|a_{ij}|$ divided by $|a_{ij}|$ is equal to $q_i q_j \cos \theta_{ij}$, where θ_{ij} is already defined and q_i and q_j are respectively the length of the perpendiculars for the ends of a_i and a_j on the flats F_1 and F_2. Making use of these and some well-known results of hyperspace geometry the author derives all those results of a previous paper by him jointly with two others (*Sankhya*, Vol. 3(1), 1937, pp. 1–40), which were then deduced by algebraic induction, sometimes not fully carried through. Besides giving deeper insight into all the algebraic process of the earlier paper the present paper gives a simple geometrical interpretation of different types of co-ordinates introduced there.

S. N. R.

III. PHYSICS

(including Physics and Meteorology).

GENERAL PHYSICS.

1. **BANERJEA, G. B. and PATTANAIK, B.**—Viscosity of Air and the Electronic Charge. *Nature*, CXLI, pp. 1016-1017, (1938). [See following Abstract.]

2. **BANERJEA, G. B. and PATTANAIK, B.**—Electronic Charge from Viscosity of Air. *Zeits. f. Physik*, CX, pp. 676–687, (1938).

The authors give an account of an accurate determination of the viscosity of air. The electronic charge *e* is then calculated by utilising the value of viscosity so obtained in Millikan's oil drop experiment.

J. N. B.

3. **BANERJEE, K. and AHMED, R.**—Structure of Aromatic Compounds. Part IV. Space Group and Atomic Arrangements in Phloroglucine Dihydrate. *Ind. Journ. Phys.*, XII, pp. 249–258, (1938).

An analysis of phloroglucine dihydrate by X-rays is described. The axial lengths are $a_0 = 6{\cdot}80$, $b_0 = 8{\cdot}103$ and $c_0 = 13{\cdot}70$ in Angstrom units. The $o\ k\ l$ planes are absent when $k+l$ is odd and $h\ o\ l$ planes are absent when $h+l$ is odd. So the space-group is D^{12}_{21} P n n m. The density of the crystal is found to be 1·394 gms. per c.c., hence there are 4 molecules per unit cell. Molecular orientation in the crystal lattice is determined from considerations of magnetic anisotropy and space-group.

K. B.

4. **BANERJEE, K. and BHATTACHARJYA, J.**—On Magnetic Anisotropy of Crystals in Relation to Crystalline Structure. *Science and Culture*, IV, pp. 60-61, (1938).

The note reports the results of measurements on the magnetic anisotropy of certain crystals and the conclusions arrived at.

J. N. B.

5. **BANERJEE, K. and HAQUE, A.**—Structure of Aromatic Compounds. Part III. Benzophenone. *Ind. Journ. Phys.*, XII, pp. 86–94, (1938).

Cell dimensions of benzophenone have been determined by rotation photographs to be $a_0 = 10{\cdot}17$ Å, $b_0 = 12{\cdot}06$ Å, and $c_0 = 7{\cdot}98$ Å, with 4 molecules per unit cell. From a combination of oscillation and Weissenberg camera photographs the space-group has been found to be $D^4_2 P2_12_12_1$. From considerations of the magnetic anisotropy of the crystal the two benzene rings in the benzophenone molecule has been found to be inclined to each other at 135° nearly, the connecting C atom lying at the intersection of these two planes. The line bisecting the acute angle between these planes lies along the *b*-axis, while the mean plane is inclined to the c-axis by 22°25′.

K. B.

6. **BANERJEE, K. and HAQUE, A.**—Space Group of Creatinine. *Ind. Journ. Phys.*, XII, pp. 183–194, (1938).

The cell dimensions of creatinine has been determined by the rotation photograph method with results, $a_0 = 14{\cdot}86$ Å, $b_0 = 13{\cdot}14$ Å, $c_0 = 5{\cdot}85$ and $\beta = 110°\ 36'$. The number of molecules per unit cell is thus calculated to be 8. From oscillation photographs it is concluded that no systematic absence of planes occur and hence the space-group is found to be $C^1_{2h}/P_2/m$.

K. B.

7. **Banerjee, K.** and **Sinha, K. L.**—Structure of Aromatic Compounds. Part II. Benzil. *Ind. Journ. Phys.*, XI, pp. 409–416, (1938).

The space-group of benzil crystal has been found to be $D^4{}_3C_{31}{}^2$ and $D_3{}^6C_{32}{}^2$ for the two enantiomorphic forms. The molecular plane of each molecule is inclined to the triad axis at 13°, the three molecules are parallel to the three basal axes and are arranged spirally about a three-fold screw-axis.

K. B.

8. **Bhabha, H. J.**—Theory of Heavy Electrons and Nuclear Forces. *Proc. Roy. Soc.*, CLXVI, Ser. A., pp. 501–528, (1938).

A theory is developed based on the idea that the proton and neutron are two states of the same particle, which can go over from one state to the other by the emission of a charged particle of mass intermediate between those of the proton and electron, as originally suggested by Yukawa. These 'U-particles' are described by four wave-functions. Quantisation of the theory leads as usual to positive and negative U-particles with a spin of one unit. The U-particles are identified with the heavy electrons of cosmic radiation. The theory leads uniquely to short range forces of the Heisenberg and Majorana type of such a sort as to allow one to make the ground state of the deuteron the triplet state, the sign of the Majorana force being not at our choice. The range of the forces is connected with the mass of the U-particles as before, and demands a mass of some 200 times the electron mass. The relativistic generalisations of a pure Heisenberg and pure Majorana force are given. The relativistic scattering of U-particles by protons and neutrons is calculated. The theory also leads to showers of Heisenberg's type, but consisting mainly of heavy electrons, a few electrons, and some heavy particles.

H. J. B.

9. **Bose, U. K.**—Cathodic Sputtering. *Ind. Journ. Phys.*, XII, pp. 95–108, (1938).

Variation of sputtering with pressure has been investigated quantitativley. It is found that there is a pressure for which the sputtering is maximum; below this pressure the sputtering decreases very rapidly, and above it the sputtering changes hyperbolically.

Zone formation of the usual type has been investigated. Observations show that the sputtered particles form a pseudo-gas.

Some data pertaining to approximate pressure, current, length of dark space, and time of exposure for obtaining films of Cu, Ag. Ni, Fe and Al are given.

U. K. B.

10. **Chakrabertty, S. K.** and **Ganguly, P. B.**—Equation for Viscosity of Mixtures. *Proc Nat. Acad. Sci. Ind.*, VII, pp. 205–221, (1937).*

An expression of the form $\log \eta_{sol} - \frac{1}{3} \log \rho_{sol} = C_1 + C_2 x_2$ can be deduced from Andrade's equation for viscosity on the basis of certain assumptions. The applicability of the above equation has been tested by considering 18 binary systems. On plotting the value of $\log \eta_{sol} - \frac{1}{3} \log \rho_{sol}$ against x_2 the graphs have been found to be straight lines in many cases. In the case of systems, the components of which have polar properties and are dissimilar in nature, the divergence is marked. This is explained as due to loose compound formation. The viscosity values calculated from MacLeod's equation have been compared with those obtained from the above equation. The latter equation gives somewhat better values.

S. K. C.

11. **Chandra, K.**—Instability of Fluids Heated from Below. *Proc. Roy. Soc.*, CLXIV, Ser. A, pp. 231–242, (1938).

The motion of air enclosed in a shallow cell heated at the base and cooled at the top has been investigated. Two distinct types of motion are observed. In type I the air moves downwards in the centre and in type II it rises up in the centre. In both cases cellular vortices occur which are less clearly defined in the latter than in the former type. The motion is made visible by the use of smoke.

J. N. B.

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* Not abstracted in 1937.

12. **Dasannacharya, B.**—Development of the Minor Axis in a Foucault Pendulum. *Phil. Mag.*, XXV, pp. 601–622, (1938).

Experimental tests to study the effect of variation of certain quantities related to a Foucault pendulum are discussed in detail. J. N. B.

13. **Dasannacharya, B.** and **Seth, A. C.**—Optical Silvering on Glass. *Phil. Mag.*, XXVI, pp. 953–970, (1938).

A detailed account is given of the method of silvering on glass with special reference to temperature, cleaning, etc. J. N. B.

14. **Dass, K. S. G.** and **Rao, B. S.**—Theory of Contact Angles. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 113–117, (1938).

A theory of contact angles is developed. The phenomena at the interface between a solid and a liquid are discussed on the basis of the theory. K. S. G. D.

15. **Das, S. R.** and **Ghosh, K.**—The Structure of Sulphur Particles in Colloidal Suspension in Water. *Science and Culture*, IV, pp. 132-133, (1938).

A new method of investigation by the X-ray diffraction method has been developed by the authors and applied to study the structure of sulphur particles in colloidal suspension in water. The note reports the results of these investigations. J. N. B.

16. **Das, S. R.**—A Study of Sulphur Allotropes by the X-ray Diffraction Method. Part I. *Ind. Journ. Phys.*, XII, pp. 163–182, (1938).

The structures of the various allotropes of sulphur have been studied by Hull's diffraction method under varying temperatures ranging between — 183°C and 130°C. Some of the allotropes, hitherto regarded as amorphous, are reported to have exhibited a well-defined crystalline pattern. The special features characterising the patterns obtained at temperatures lying between 80°C and 110°C are fully discussed.

Patterns of liquid sulphur have been obtained at temperatures round about 120°C and in each case two bands have been observed. J. N. B.

17. **Dube, G. P.**—Statistical Theory of Adsorption. Part III. Theory of Two-Layer Adsorption with Correlation in the First Layer. *Proc. Camb. Phil. Soc.*, XXXIV, pp. 587–598, (1938).

A statistical theory of adsorption is worked out on the assumption that atoms are adsorbed in definite positions on the surface and that atoms of a second layer are adsorbed at places where four neighbouring sites forming a square are already occupied by the atoms of the first layer. The probability that the four corners of a square in the first layer will be occupied is calculated on the Bethe approximation and this probability has been taken to determine the number of sites available for occupation by the second layer atoms. The fact that the possibility of attachment of a second layer atom should increase the probability of simultaneous occupation of the four neighbouring sites has, however, been neglected in the calculation. J. N. B.

18. **Forster, R. B.** and **Vaidya, B. K.**—Colour Measurement on Natural Cotton. *Current Science*, VI, pp. 379-380, (1938).

The intensity of light reflected from the surface of six samples of cotton has been compared on a visual spectrophotometer with that reflected from a standard white surface of magnesium oxide. The results are depicted by means of graphs. J. N. B.

19. **Ganguli, A.**—On the Theory of Liquids. *Ind. Journ. Phys.*, XII, pp. 25–34, (1938).

A general form of distribution function of molecules is given and special cases for gases, liquids and solids are considered.

The consequences of the different terms in the potential energy as given by London are considered and a qualitative explanation of rotation in liquids and solids, viscosity, polymerisation, formation of glass, secondary structure, etc., is offered.

While some liquids having symmetrical molecules have the same grouping or clustering of molecules as in solids, others have varying co-ordination numbers.

Certain simplified expressions for distribution function, cohesion, internal forces, viscosity, etc., are reviewed.

Van der Waal's equation is discussed at length and cohesive forces and viscosity are calculated therefrom.

Some relations for viscosity, due to Guzman, Andrade and others, and time of relaxation are obtained in a simplified manner.

A. G.

20. **Ganguli, A.**—Hydrous Oxide Hydrosols and Gels. *Acta Physicochimica*, IX, pp. 197–201, (1938).

Freshly prepared sols and gels of hydrous oxides are truly amorphous. In accordance with the views of the author on the amorphous state these consist of long-chain complexes. During the course of ageing and desiccation the amorphous bodies pass to the poly-crystalline and finally to the crystalline forms. The thixotropy, gelation and high viscosity of these sols, the swelling of gels and the X-ray patterns are explained on the above view.

A. G.

21. **Ghosh, I. C. and Sengupta, S. B.**—Fluorescence, Absorption Spectra and Conductivity of Aqueous Solutions of Fluorescein, Rhodamine and Acriflavin. *Zeits. f. Phys. Chem.*, XLI, Abt. B, 2, pp. 117–141, (1938).

Absorption spectra of different solutions in relation to concentration, and the output in relation to cell thickness, wave-length of emission and various other factors have been investigated. The substances studied are solutions of potassium fluoresceinate, acid salts of rhodamine B and acriflavin. It has been found that the fluorescent quantum efficiency is independent of the exciting wave-length and of concentration for great dilutions. With increasing concentration, however, it is found to decrease rapidly.

J. N. B.

22. **Guha, B. C.**—Structure of Anthraquinone. *Phil. Mag.*, XXVI, pp. 213–223, (1938).

The arrangement of the atoms in the anthraquinone crystal has been determined by the trial and error method. It has been found that the C atoms are all in one plane, and the C plane is tilted from the (001) plane by 6° about each of the '*a*', '*b*', and '*c*' axes. The hexagons deviate slightly from regularity; the side rings have all the internal angles equal to 120°, but the lengths of sides are alternately 1·35 Å and 1·46 Å. For the middle ring the internal angles differ from 120°; the angle between the two single bonds is 109°, and that between a single bond and a double bond is 125°. The C—C bonds are 1·46 Å and the C = C bonds are 1·35 Å, as in the outer rings. The O atoms are inclined to the carbon plane unsymmetrically, the C = O distances being 1·13 Å each.

B. C. G.

23. **Gupta, H. C.**—Viscous Flow Past a Circular Cylinder. *Phil. Mag.*, XXVI, pp. 1085–1109, (1938).

The author has presented a new step-by-step method for the numerical solution of Prandtl's boundary layer equations and applied it to a particular case.

J. N. B.

24. **Gupta, J.**—Hexa-Co-ordination in Telluric Acid and in Molybdates and Tungstates in Solution. *Ind. Journ. Phys.*, XII, pp. 223–232, (1938).

Following a previous communication on the subject, telluric acid and several molybdates and tungstates have been examined by their Raman spectra in the crystalline state and in aqueous solutions of definite hydrogen ion concentration. Theoretical and experimental evidence for the author's previous suggestion that in aqueous solutions, the normal molybdate and tungstate ions are present, like telluric acid, as dihydrated octahedral units, have been adduced. Extra lines recorded by other workers in solutions have been shown to be not due to vibrations of the normal molybdate or tungstate ions, but some of them are due to isopoly complexes present in such solutions.

J. G.

25. **Kane, J. G.** and **Jatkar, S. K. K.**—Adsorption from Binary Mixtures by Charcoal and Silica Gel. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 331–344, 385–394, 407–411, 413–416, (1938).

26. **Katz, J. R.**, **Desai, M. C.** and **Seiberlich, J.**—Viscosity of Starch Pastes. *Trans. Faraday Soc.*, XXXIV, pp. 1258–1268, (1938).

It was found that a starch paste is not at all comparable with a colloidal solution or a colloidal gel. When heated or mechanically treated, the thin vesicle walls break. They break much more readily under mechanical treatment on heating than at room-temperature or at 0°C. Instead of being plastic, the vesicle walls at lower temperature have become elastic. This same fact is responsible for the setting of starch puddings. Even in 1% starch pastes there is no proportionality between viscosity and concentration. The microscopical picture is too complicated for such a simple proportionality. In the same way, there is no reason to expect that (even for 1% pastes) the viscosity is independent of the pressure under which it flows. The factor which probably contributes most to the complexity of the system is the relatively small amount of free water between the vesicles. In concentrated starch pastes this water almost vanishes (or shrinks to a small amount). The viscosity (especially at the maximum, but probably all along the viscosity curves) is due, not only to a flow of water, made somewhat more difficult by the suspension in the water of a large amount of starch vesicles, but also to the rubbing of these vesicles against one another. This has to be taken into account as an essential part of the viscosity.

J. R. K.

27. **Koteswaram, P.**—Molecular Association of Acetic Acid. *Zeits. f. Physik,* CX, pp. 118–133, (1938).

The Raman spectrum of acetic acid in solutions of H_2O, C_6H_6 and CCl_4 has been studied. A variation of the Raman frequencies is observed in the aqueous solution while no such phenomenon is noticed in the case of non-polar solvents. The author suggests a probable cause of this effect and also discusses the structure of the hydrates of acetic acid.

J. N. B.

28. **Koteswaram, P.**—Dissociation in Sulphuric Acid with Temperature. *Ind. Journ. Phys.*, XII, pp. 299–304, (1938).

The effect of temperature on sulphuric acid is studied with the aid of Raman effect. As in the case of dilution, shifts are observed in the lines 558, 928 and a definite increase in intensity is noticed in the 1050 line which is attributed to the HSO_4 ion. The similarity in the changes produced by dilution and temperature is interpreted as due to the progressive dissociation of the acid even with temperature into HSO_4 and SO_4 ions. That the strong continuum usually observed in the Raman spectrum of sulphuric acid can be removed by heating it with potassium permanganate, potassium dichromate, or a trace of nitric acid or even by heating to about 200°C, is pointed out.

P. K.

29. **Koteswaram, P.**—Effect of Temperature on the Dissociation of Sulphuric Acid. *Current Science,* VI, pp. 445-446, (1938). [See preceding Abstract.]

30. **Krishnan**, R. and **Jatkar**, S. K. K.—Influence of Rate of Flow in Siemens Ozoniser. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 467–475, (1938).

A simple design for an ozoniser has been described for utilising the balanced windings of the cheap neon sign transformer. The results of experiments conducted with pyrex ozonisers having an annular gap of 3 mm., at 8·5 kv yielded results which were comparable with a similar ozoniser having 4 mm. gap at 10 kv, and with the latter exciting voltage, the results were as good as those obtained with two 4 mm. gap ozonisers put in series. The soft glass ozoniser was nearly twice as efficient as the pyrex ozoniser. The results of experiments on the formation of O_3 from air in silent electric discharge by both static and dynamic methods were found to be in general agreement with the previous findings of the authors regarding the formation of atomic O. The equilibrium conditions were also found to depend upon the exciting voltage. The apparent percentage conversion of O_2, however, was found to be less for lower rates of passage at lower voltages, and at a particular rate, apparently no O_3 was obtained. Atomic O is apparently far more stable in air than in O_2, the proportion of O to O_3 being 2 to 1. The remarkable divergence in the values of equilibrium conversion, observed between the static and the dynamic conditions at higher voltages, has been explained on the basis of the reducing action of atomic O on the reactions of O_3.

R. K.

31. **Krishnan**, R. S.—Reciprocity Theorem in Colloid Optics. *Proc. Ind. Acad. Sci.*, VII, Sec A, pp. 21–34, (1938).

The present work is an extension of the author's earlier work on depolarisation of light-scattering in colloids. The reciprocity relation between the three depolarisation factors ρ_u, ρ_v and ρ_h for transverse scattering is deduced theoretically. It is pointed out that this relation is valid only for solutions having a large number of particles having random distribution. Satisfactory agreement between observed results and deductions from this relation is obtained.

J. N. B.

32. **Krishnan**, R. S.—Dispersion of Depolarisation of Light-Scattering in Colloids. *Kolloid Zeits.*, LXXXIV, pp. 2–8, (1938).

The significance of the three depolarisation factors ρ_u, ρ_v and ρ_h is discussed and the reciprocity relation connecting them is given. It is shown that when the particles are large and aspherical, the depolarisations vary with the wave-length of the incident light. A method of determining the variation of depolarisation is described.

J. N. B.

33. **Krishnan**, R. S.—Molecular Aggregation and Light-Scattering. *Kolloid Zeits.*, LXXXIV, pp 8–15, (1938).

The author describes the phenomenon of opalescence exhibited by liquid mixtures near the critical solution temperature. The colloidal nature of such liquid mixtures is discussed in relation to the colour of the opalescence and to some other physical properties. It is shown that the experimental methods for determining ρ_h are also apt for finding molecular aggregation and hence for revealing the similarity between critical liquid mixtures and colloidal solutions. Results of such experiments made by the author are described.

J. N. B.

34. **Krishnan**, K. S. and **Banerjee**, S.—Magnetic Anisotropies and the Valencies of Paramagnetic Atoms in Crystals. *Nature*, CXLII, p. 717, (1938).

The note discusses the importance of studies on the magnetic anisotropies of paramagnetic crystals and refers to the various topics on which valuable information can be obtained from such studies.

J. N. B.

35. **Krishnan, K. S.** and **Banerjee, S.**—Magnetic Studies on Rhodochrosite, $MnCO_3$. *Zeits. f. Krist.*, XCIX, pp. 499–508, (1938).

The paper gives a report of measurements on the magnetic anisotropy, and on the mean susceptibility at different temperatures, of rhodochrosite ($MnCO_3$). The mean susceptibility of the crystal is of the order of $12{,}000 \times 10^{-6}$ per gm. mol. of $MnCO_3$, at room-temperature, and its temperature variation conforms to the formula $\chi = 3{\cdot}81/(T+13)$, from which the magnetic moment of the Mn^{2+}ion comes out as 27·5 Weiss magnetons. The anisotropy of the crystal is very feeble, as should be expected, being about $7{\cdot}2 \times 10^{-6}$per gm.mol. at room-temperature, which is only 0·06% of the mean susceptibility. This corresponds to a separation between adjacent levels in the Stark-pattern of Mn^{2+}, produced by the crystalline electric fields acting on it, of the order of 0·07 cm.$^{-1}$.

K. S. K.

36. **Krishnan, K. S.** and **Bose, A.**—Coupling between the Orbital and the Spin Angular Momento of Paramagnetic Ions from Magnetic Measurements. *Nature*, CXLI, p. 329, (1938).

The constant of spin-orbit coupling in Ni^{++} has been calculated from the observed magnetic anisotropy of $Ni\ SO_4.\ 6H_2O$ and $Ni\ SoO_4.6H_2O$ crystals at −183° and 23°C. It is seen that the value agrees well with the value obtained from spectroscopic data.

J. N. B.

37. **Krishnan, K. S.** and **Mookherji, A.**—Magnetic Anisotropy and Structure of $CuSO_4.5H_2O$. Part II. *Phys. Rev.*, LIV, pp. 533–539, (1938).

In Part I of this paper were reported some magnetic measurements on the crystal of $CuSO_4.5H_2O$. The crystal, though triclinic, has nearly uniaxial magnetic symmetry, and the symmetry axis is the direction of minimum susceptibility for the crystal. This observed uniaxial symmetry and the negative sign of the anisotropy were shown to follow naturally from the known fine structure of the crystal, and the direction of the symmetry axis also is nearly that predicted from the structure. In the present paper are described further magnetic studies on the crystal, and a more detailed correlation with its structure. The magnetic data are also discussed in relation to the magnitude and the asymmetry of the internal electric fields acting on the Cu^{++} ions in the crystal. A general method is described for determining, for any triclinic crystal, the principal magnetic axis and susceptibilities, *i.e.*, the constants of the magnetic ellipsoid.

K. S. K.

38. **Krishnan, K. S.** and **Mookherji, A.**—Magnetic Anisotropy and Structure of $CuSo_4.5H_2O$. Part III. *Phys. Rev.*, LIV, pp. 841–845, (1938).

Measurements have been made of the magnetic anisotropy of $CuSO_4.5H_2O$ at different temperatures from 26°C to −190°C. The crystal is nearly uniaxial magnetically, and its two principal susceptibilities conform roughly to the Curie law, with different Curie constants. The observed anisotropy of the crystal may be attributed to the anisotropy induced in the Cu^{++} ion under the influence of the asymmetric electric field of the neighbouring negatively charged atoms. From the known positions of those atoms the field should be expected to have tetragonal symmetry. The two principal susceptibilities of the Cu^{++} ion. along the tetragonal axis of the field, and perpendicular to the axis, respectively, are calculated. The corresponding effective magneton numbers are calculated therefrom, and it is found (1) that these magneton numbers vary little with temperatures, and (2) that the magneton numbers corresponding to the two principal susceptibilities of the ion are widely different.

K. S. K.

39. **Krishnan, K. S.** and **Mookherji, A.**—Magne-Crystallic Action. Part V. Paramagnetic Salts of the Rare-Earth and the Iron Groups. *Phil. Trans. Roy. Soc.*, CCXXXVII, pp. 135–159, (1938).

An account is given of measurements on the magnetic anisotropy and the mean susceptibility of a large number of paramagnetic crystals, among which are several salts of the rare earths, many of the Fe group, and some feebly paramagnetic salts. The results are discussed, on the basis of the theory of van Vleck, Penney and Schlapp, in relation to the Stark-splitting of the energy levels of the paramagnetic ions under the influence of the strong crystalline electric fields acting on the ions. A detailed calculation is given of the constants of the crystal field in the Ni salts. The striking contrast in the magnetic behaviour of the six-coordinated and the four-coordinated Co compounds, predicted by the theory, is verified experimentally. The former salts are strongly anisotropic magnetically, while the latter are only feebly so. The mean susceptibilities of the former deviate more from the 'spin only' value than those of the latter. All the salts of the Fe group, except those of Co, have two of their principal susceptibilities nearly equal, *i.e.*, the magnetic ellipsoids of these crystals approximate to a spheroid. The conclusion drawn from studies on the absorption spectra of some of the rare-earth salts that the fields acting on the rare-earth ions in these crystals should be almost cubic in symmetry is not supported by observations on the magnetic anisotropy of these crystals.

K. S. K.

40. KRISHNAN, K. S. and SESHAN, P. K.—Absorption and Fluorescence of Chrysene Molecule. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 487–498, (1938).

Chrysene crystal is monoclinic and, as usually prepared, is in the form of a flake parallel to (001). The molecular planes are inclined at 79° to (001), and their intersections with (001) make angles of $+\phi$ and $-\phi$ with the b-axis, where $\phi = 29\frac{1}{2}°$. The fluorescence of the crystal was excited by the 3650 group of lines of the Hg arc, incident normally on the flake, and was analysed in the forward direction for its polarisations and intensity. The following results were obtained: (1) Whether the incident vibrations are along a or along b, the a vibrations in forward fluorescence are much weaker than the b vibrations, the ratio of their intensities being 0·40, which is nearly equal to $\tan^2\phi$. From this it is concluded that when the incident light-vibrations are along the normal to the plane of a molecule there is hardly any fluorescence excited in it, and that it is only vibrations in the plane that excite fluorescence. (2) With a crystal thick enough to absorb *completely* the exciting radiations, the intensities of forward fluorescence excited by the a and the b vibrations separately, are practically equal. From this observation it follows that the absorption coefficients for the a and the b vibrations should bear the ratio $\tan^2\phi$: 1. This conclusion is verified by direct measurements on the absorption coefficients. The obvious interpretation of this result is that when the incident light-vibrations are along the normal to the molecular plane there is hardly any absorption; and it is only vibrations in the plane that are absorbed. (3) The relation between fluorescence and absorption is discussed.

K. S. K.

41. KULKARNI, B. S. and JATKAR, S. K. K.—Interfacial Tensions of Pure Soap Solutions. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 394–405, (1938).

Interfacial tensions against benzene, of aqueous solutions of Na and K soaps of the homologous series are measured and the results compared with corresponding surface tension measurements by other workers. The results are discussed in the light of the previous theories on the subject and explanations are given for the maximum activity shown by the myristate, and for the increased activity due to unsaturation, presence of hydroxyl group and replacement of Na by K in the soap molecule. The various units participating in the soap solution equilibria appear to possess surface activity to a smaller or greater extent; the simple ions of the soaps of the lower series due to their higher osmotic activity, and the aggregated particles of the higher series of fatty acids, due to their less sensitivity to the surface forces, appear to be less surface-active than the simple molecules. As these are entirely dissociated, it would appear that the surface activity is mainly dependent upon the nature of the anions. As the latter get concentrated at the surface the kations form a double layer with oriented anions. The difference between the surface activity of Na, K and even NH_4 and Li soaps, observed by different workers, thus appears to be due to the fact that the entire soap molecule gets concentrated at the interface.

B. S. K.

42. Majumdar, V. D. and Vajifdar, M. B.—Viscosity of Air. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 171–178, (1938).

Using a modified form of Wagstaff's apparatus for measuring the coefficient of viscosity of air by the method of interference fringes and using capillary tubes, the value of η has been found to be $(1834{\cdot}38 \pm 0{\cdot}35) \times 10^{-7}$ c.g.s. units. The value of the electronic charge, e, calculated with this value of η is $4{\cdot}816 \times 10^{-10}$ e.s. units. Both these values are in close agreement with those obtained recently by other workers using different methods.

V. D. M.

43. Mitra, S. K. and Rakshit, H.—Distribution of the Constituent Gases and their Pressures in the Upper Atmosphere. *Ind. Journ. Phys.*, XII, pp. 47–62, (1938).

One of the main problems in the study of the upper atmosphere is the distribution of the constituent gases and their pressures. In order to carry out the calculations it is necessary to know approximately the height at which diffusive equilibrium of the constituent gases under the action of gravity begins to be important. Investigations by Maris and by Epstein show that equilibrium sets in rapidly in regions of low pressure. The question as to the level from which diffusive equilibrium will begin to be important can be settled by observations on the disturbing causes. This level should commence from the height at which the time taken for appreciable separation of the constituents is small compared with the period of the disturbance. From a consideration of disturbing winds which are known to exist at levels of 70 to 100 km. the lower limit of the height of diffusive equilibrium level may be taken as 100 km. In the present paper an attempt has been made to calculate the upper limit by making certain assumptions regarding the temperature and the constituent gases of the upper atmosphere.

It is found that for an upper atmosphere consisting of N_2 and O and with temperature increasing with height the constituents are in diffusive equilibrium above 350 km. Below 175 km. they are more or less completely mixed up; in the intermediate region there is only partial mixing.

If the constituents are assumed to be N_2 and O_2 then the corresponding levels are 250 km. and 175 km. on the assumption of a rising temperature and 175 km. and 150 km. for a constant temperature.

Calculations are also made of the pressures at and the amounts of the constituents existing above different levels in the upper atmosphere. The values of both of these are higher than those obtained by previous workers.

It is found that the calculated pressure at a height of 250 km. (if the constituent gases are N_2 and O and a high temperature is assumed) agrees fairly well with that obtained from measurements of collisional frequency of electrons in the F region by radio methods.

S. K. M.

44. Nilkantan, P.—Magnetic Anisotropy and Pleochroism of Biotite Mica. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 39–60, (1938).

The author has studied the paramagnetic anisotropy and susceptibility, pleochroism and the ferrous and ferric contents of certain biotites, one muscovite and one phlogopite. Satisfactory agreement between the experimental results and Van Vleck's theory of paramagnetism has been obtained.

J. N. B.

45. Nilkantan, P.—Magnetic Anisotropies of Egg Shells. *Current Science*, VII, pp. 48-49, (1938).

The author has determined the magnetic anisotropy of several specimens of egg shells. It is found that while the susceptibilities of shells are nearly the same as that of calcite, the values of magnetic anisotropy are distinctly lower. These results are discussed in the light of optical examination of egg shells under the polarising microscope.

J. N. B.

46. **Prakash, S.** and **Dutt, S.**—Colour and Chemical Constitution. The Organic and Inorganic Salts of Diphenyl Violuric Acid. *Proc. Nat. Acad. Sci. Ind.*, VIII, pp. 29–39, (1938).

The relation between the colour and chemical constitution of a large number of salts of diphenylvioluric acid has been investigated. Diphenylvioluric acid in the solid state and also in solution in non-hydroxylic organic solvents is pale yellow in colour but the salts formed on treatment with alkalies or organic bases are intensely violet. The change in colour is ascribed to a transition from an oximino-ketonic to a nitrosoenolic structure of the molecule. A study of the absorption spectra and hydrolysis constants of the salts has shown that the intensity of the colour is roughly proportional to the strength of the basic character of the base.

J. N. B.

47. **Prosad, K.** and **Ghosh, B. N.**—Spreading of Liquids in Filter Paper. Part II. *Kolloid Zeits.*, LXXXIV, pp. 275–283, (1938).

The authors describe experiments and the results thereof on the adsorption of H_2SO_4, HCl and H_3PO_4, etc. of different concentrations. Curves relating the speed of spreading with area wetted are discussed.

J. N. B.

48. **Prosad, K.** and **Sen, D. N.**—Trajectory of Ash Particles in Air and the Determination of their Size. *Phil. Mag.*, XXV, pp. 993–1003, (1938).

The paper is concerned with the theoretical and experimental investigations of the trajectory of cigar ash particles shot out in a horizontal direction in air, from a narrow orifice by effluent air under a measured driving pressure in the form of a jet. The theoretical and experimental curves fit in very well. From the investigations made, it has been found possible to determine the average size of the ash particles, assumed spherical, which, as a result of coagulation, must be growing in bulk rapidly during their flight. The experimental value of the radius has come out to be $2{\cdot}34 \times 10^{-3}$ cm., and is considered satisfactory. The method is claimed to be a novel one and admits of extension and application to the study of the general problems of 'smokes' and 'aerosols' under different conditions. The present study has suggested further extension of the problem by taking simultaneously into account: (*a*) initial particles of different sizes, and (*b*) growth of the particles under flight in the same effluent jet. These and other aspects noted in the body of the paper are now under investigation.

K. P.

49. **Puri, A. N.**—Anomaly in Elastic Behaviour of India Rubber. *Proc. Nat. Acad. Sci. Ind.*, VII, pp. 45–51, (1937).*

The Young's modulus and rigidity for a sample of India rubber are determined. Young's modulus is measured both statically and dynamically. It is found that the dynamical value is about twice the statical value for all loads. The cause of this anomaly is observed but no satisfactory explanation has been found.

A. N. P.

50. **Puri, A. N.**—An Anomaly in the Elastic Behaviour of India Rubber. *Science and Culture*, IV, p. 253, (1938).

The note reports the observed difference in the values of Young's modulus and rigidity of India rubber determined by dynamical and statical methods. [See preceding Abstract.]

J. N. B.

51. **Raman, C. V.** and **Venkateswaran, C. S.**—Debye Heat Waves in Highly Viscous Liquids. *Nature*, CXLII, p. 791, (1938).

Using a new type of zinc-amalgam lamp developed by one of the authors, it has been discovered that light scattered backwards by such a highly viscous liquid as glycerine at 20°C, when analysed with a Fabry-Perot étalon, exhibits well-defined Brillouin components on either side of the incident lines, along with a continuous background.

J. N. B.

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* Not abstracted in 1937.

52. **Ramdas, L. A. and Vaidyanathan, P. S.**—Spreading of Substances on Water. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 186–195, (1938).

Due to monomolecular spreading a slab of camphor floating on water dissolves more rapidly at the camphor-air-water boundary than in any other region. The rate of this boundary solution has been studied in relation to the perimeter, area and shape of the slab and also other factors and the results are discussed. J. N. B.

53. **Ramkrishna Rao, I. and Koteswaram, P.**—The Constitution of Heavy Water. *Ind. Journ. Phys.*, XII, pp. 63–74, (1938).

The Raman band of heavy water is found to be similar to that of ordinary water both in diffuseness and extent. The variations with temperature in the structure of this band are also similar to those of ordinary water. These changes are attributed to changes in the relative proportions of D_2O, $(D_2O)_2$ and $(D_2O)_3$ molecules which are assumed to be in thermal equilibrium. By an analysis of the intensity curves of the band, the proportions of the three polymers at different temperatures are calculated. The results are compared with those of water and the points of similarity and differences explained on the basis of their other physical properties. I. R. R.

54. **Rao, B. S. M. and Iyengar, K. V.**—Inequality Concerning Lattice Sums. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 524–528, (1938).

The paper reports some inequalities connected with lattice sums noticed during an investigation on the optical anisotropy of a liquid. J. N. B.

55. **Rao, I. R. and Koteswaram, P.**—Constitution of Heavy Water. *Nature*, CXLI, pp. 331-332, (1938). [See Abstract No. 53.]

56. **Ray, P.**—Extension of Periodic Table and Elements beyond Uranium. *Science and Culture*, IV, pp. 167–171, (1938).

A brief review of the results of experiments on nuclear bombardment. J. N. B.

57. **Sen, B. M.**—Nuclear Structure of Light Atoms. *Ind. Journ. Phys.*, XI, pp. 427–432, (1938).

It has been suggested in the paper that the nucleus may be regarded as a kind of crystalline structure rather than an ensemble of protons and neutrons, as a static or at any rate a quasi-static system, rather than dynamical. The principles and methods of Quantum Mechanics have not, therefore, been applied. Born's unitary theory gives a field which differs only slightly from the Coulomb field, which may be supposed to be playing an important rôle in the nuclear structure. On this hypothesis, it has been shown that the ratio between two fundamental distances in the assumed structure for α-particles lies between two narrow limits. Calculations from mass-defects give the distance between elementary particles of the nucleus as of order 10^{-14} cms., the figure generally accepted. The structure of the isotopes of hydrogen, helium and lithium has also been considered. Since the identity of the different elementary particles of the nucleus of the same isotope is denied, the difficulty about the continuous energy-spectrum of β-radiation seems to admit of a simple solution. B. M. S.

58. **Sen, B. N.**—Parachors and Thermal Conductivity of the Metallic Elements. *Gazz. Chim. Ital.*, LXVIII, pp. 307–311, (1938).

The author deduces a relation connecting the thermal conductivity of a metal with the parachor P, the atomic diameter, atomic weight, atomic number and some other atomic constants. The conductivity calculated from this relation gives satisfactory agreement with experimental values. J. N. B.

59. **Sen, B. N.**—Minimum Distance of Approach Between Atoms. *Gazz. Chim. Ital.*, LXVIII, pp. 656–661, (1938).

The author presents a modified form of his previous expression for the minimum distance of approach between atoms in terms of several atomic constants. Satisfactory agreement with experimental results is obtained.

J. N. B.

60. **Sen, B. N.**—Parachors and Velocity of Sound in Metals. *Gazz. Chim. Ital.*, LXVIII, pp. 662–664, (1938).

The author deduces an expression for the velocity of sound in metals in terms of a number of atomic constants. Values of the velocity calculated from this expression for the cases of Ni, Zn, Pb, Cu, Hg, Cd, Al agree fairly with experimentally observed values.

J. N. B.

61. **Shanker, J.** and **Prasad, M.**—Magnetic Anisotropies and Molecular Orientations in Crystals of Acenaphthene. *Current Science*, VI, pp. 554–555, (1938).

Values of K_1, K_2 and K_3 have been calculated for the molecule of acenaphthene from the recent values obtained by Krishnan and Lonsdale for the magnetic anisotropies of naphthalene crystals. It has been shown that the value of K_2 is very nearly the same as that of χ_b for acenaphthene which shows that the two directions are coincident. The inclination of the molecular plane to the *C* (001) plane has been calculated with the new values and found to be 37° 30′.

J. N. B.

62. **Siddiqi, M. R.**—On the Theory of a Non-linear Partial Differential Equation of the Elliptic Parabolic Type. *Ind. Journ. Phys.*, XII, pp. 109–120, (1938).

The 'Fourier Method' developed by the author for the unique solution of general non-linear equations of the parabolic and hyperbolic types has been extended to the non-linear partial differential equation of the elliptic-parabolic type

$$\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial u}{\partial t}=u^2$$

and for certain boundary and initial conditions unique solution has been obtained.

M. R. S.

63. **Sirkar, S. C.** and **Gupta, J.**—On the Heat Capacities of a few Crystals at Low Temperatures. *Ind. Jour. Phys.*, XII, pp. 145–154, (1938).

The heat capacities of crystals of ammonium chloride, carbon dioxide, sulphur and benzene observed at low temperatures have been examined in order to ascertain whether the observed values of C_p indicate the presence of the contributions of Debye functions corresponding to the new Raman lines in the low frequency region observed with these crystals. It has been found that in the case of ammonium chloride a Debye function corresponding to the line 183 cm.$^{-1}$, and another Einstein function for the angular oscillations can explain satisfactorily the values of C_p observed at low temperatures. In the case of carbon dioxide and sulphur on the other hand, Einstein functions corresponding to the new lines, instead of Debye functions, have to be taken into account in order to explain the observed values of C_p. In the case of benzene also there is agreement between the observed and the calculated values of C_p if the Einstein functions corresponding to the new lines are taken into consideration. It is pointed out that the above fact as well as the selection rules for the appearance of Raman lines due to lattice oscillations, when applied to the crystals of benzene, definitely lead to the conclusion that the new lines are not due to lattice oscillations in the case of benzene.

S. C. S.

64. SRINIVASAN, M. K. and PRASAD, B.—Viscosity and Density of Aqueous Solutions of Weak Electrolytes at 35°C. *Trans. Faraday Soc.*, XXXIV, pp. 1139–1141, (1938).

For weak electrolytes the Jones and Dole equation is shown to assume the form $\eta/\eta_0 = 1+A\sqrt{\alpha c}+\beta(1-\alpha)c$ where '*A*' has the customary meaning. The value of '*A*' found experimentally is 0·02 for acetic, 0·03 for salicylic, 0·02 for succinic and 0·00 for benzoic acids. For acetic acid the calculated value is 0·0031 and for the other acids it should be of the same order. In all cases density varies linearly with concentration for dilute solutions.

M. K. S.

65. SRIVASTAVA, B. N.—Influence of Radiation on Ionisation Equilibrium. *Proc. Roy. Soc.*, CLXVII, Ser. A, pp. 484–499, (1938).

The generalised ionisation formula in the case of thermodynamical equilibrium for an assembly consisting of atoms, ions, electrons and radiation is derived, the particles being supposed to obey any statistics. The ionisation produced in matter has been found for the case when the reaction space is traversed by radiation at a higher temperature. The electrons have been assumed to obey Fermi-Dirac statistics, while the atom and the ion are taken to obey Boltzmann (classical) statistics. The general ionisation formula for this case is derived and two limiting cases discussed. The Woltjer-Milne formula for ionisation in any radiation field is readily obtained as a special case of the general formula. The ionisation formula for the case when the electrons behave as a degenerate gas is also deduced from the general formula. On substituting the usual expression for the probability of ionization, viz., $\psi = C\nu^{-3}$, it is found that the ionisation becomes much less when the electrons are highly degenerate.

B. N. S.

66. SRIVASTAVA, B. N.—Effusion Phenomena in Relativistic Quantum Statics. *Proc. Roy. Soc.*, CLXVII, Ser. A, pp. 516–526, (1938).

The effusion phenomena in non-degenerate and degenerate matter are investigated from relativistic mechanics. Matter obeying either Fermi-Dirac statistics or Bose-Einstein statistics is considered. Non-degenerate matter is first considered, and the number of particles as well as the mass of matter effusing out is calculated. The non-relativistic expressions are obtained as a limiting case. For $f = 10$ the departure from the value for a classical perfect gas amounts only to about 1%. The effusion is then calculated for a degenerate gas, degenerate in the sense of Fermi-Dirac statistics, both to a first approximation and to a second approximation. The non-relativistic formulae are obtained as a limiting case. In this case it is found that to a first approximation the effusion varies as p and is independent of T. but on working to a second approximation a slight dependence on temperature is observed. The average mass of particles in the effusion stream is calculated.

B. N. S.

67. SRIVASTAVA, B. N.—Heat of Ionic Dissociation of Iodides of Rubidium and Lithium and Electron Affinity of Iodine. *Proc. Nat. Inst. Sci. Ind.*, IV, pp. 365–378, (1938).

The thermal dissociation of RbI and LiI vapours into their ions has been experimentally investigated in the temperature region 1300–1500°C. by an improved apparatus which enables separate measurements of the positive ion, negative ion and electron concentrations. From these the equilibrium constant of dissociation at different temperatures is deduced. A theoretical formula then enables us to calculate the heat of ionic dissociation of the salt, the values obtained being 99·1 kcal for RbI and 129·1 kcal for LiI. The lattice energies come out to be 145·5 kcal for RbI and 167·8 kcal for LiI. Using Born cycle we get from these measurements the value of the electron affinity of iodine to be 73·6 and 76·3 kcal, the mean being 74·9 kcal. These results are in good agreement with deductions from Born and Mayer's theory and other experimental results.

B. N. S.

68. **Tandon, A. N.**—Lattice Energies of Alkali Iodides and the Electron Affinity of Iodine. *Proc. Nat. Acad. Sci. Ind.*, VII, pp. 102–110, (1937).*

By studying the dissociation equilibrium of the vapours at high temperatures, the lattice energies of KI and NaI have been determined to be 150·6 and 166·4 kg. cal., respectively. The same experimental arrangement, as described in the work on the electron affinity of chlorine by M. N. Saha and the author, has been utilised. By the application of Born's cycle to the lattice energy determinations the electron affinity of iodine has been found to be 72·4 kg . cal. The results are in good agreement with the calculations made from Born's theory and other experimental data.

A. N. T.

69. **Trenkler, F.**—Eigenschwingungen Mechanischer Molekülmodelle. (Proper Vibrations of Mechanical Molecular Models). *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 383–392, (1938).

The modes of vibration and proper frequencies for the models of certain substances are experimentally determined and compared with theoretically calculated values.

J. N. B.

70. **Varadanam, C. I.**—Viscosity and Jelly Formation of Concentrated Sols of Hydrous Stannic Oxide. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 327–332, (1938).

Krishnan's optical method has been employed to follow the changes in particle size in hydrous stannic oxide sol with the progress of dialysis. (*a*) Since $\rho_h = 1$ for the undialysed sol and continues to be at this value for the first five days of dialysis in the cold, it may be concluded that the particles are almost of molecular dimensions in the earlier stages of dialysis. (*b*) The value of ρ_h becomes less than one (from 1 to 0·49) with increased dialysis showing that the particle size has increased. (*c*) This increase in particle size is more rapid in hot than in cold dialysis. (*d*) ρ_v in both hot and cold dialysis is very low at all stages and is not much more than the error that may be attributed to a convergence of the incident beam. This indicates that the sol is made up of spherical particles. The adsorbed ammonia per gram of stannic oxide has been found to decrease rapidly at first and slowly thereafter with progress of dialysis. Viscosity determinations have also been made at different stages of dialysis and it is concluded that the increase of particle size has no correlation with the variation of viscosity.

C. I. V.

71. **Venkateswaran, C. S.**—The Nature of Lattice Oscillations in Solid Carbon Dioxide. *Current Science*, VI, pp. 378-379, (1938).

It is pointed out that the new frequency of 58 cm.$^{-1}$ recorded by Sirkar and Gupta in the Raman spectrum of solid carbon dioxide is close to the theoretically calculated value of a lattice frequency obtained from the Lindemann formula. A flexural type of intermolecular oscillation is proposed to explain the intensity and other characteristics of the new line.

J. G.

72. **Venkateswaran, C. S.**—Optical Spherometer for Non-Reflecting Surfaces. *Zeits f. Instrumentenk*, LVIII, pp. 321–323, (1938).

The paper describes a new method of measurement with a spherometer. J. N. B.

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* Not abstracted in 1937.

GEOPHYSICS AND METEOROLOGY.

73. **BAJPAI, R. R.**—Upper Air Investigations and Radio Meteorographs. *Science and Culture*, IV, pp. 6–14, (1938).

The paper first deals with older methods of upper air investigations and then discusses the modern radio meteorometric equipments. A full description illustrated by diagrams is given of a number of instruments.

J. N. B.

74. **BANERJI, S. K.**—Earthquake Problems in India. *Science and Culture*, III, pp. 637–642, (1938).

The paper contains a list of the reported earthquakes in India during the last 200 years. The nature of the waves is discussed and finally the need of further seismological investigations in India is stressed.

J. N. B.

75. **BANERJI, S. K.**—Thunderstorm Rain and Earth's Negative Charge. *Jour. Roy. Met. Soc*, LXIV, pp. 293–299, (1938).

At Bombay thunderstorms invariably move overhead in some east-west or west-east direction according as they are 'heat' thunderstorms or 'linesquall' thunderstorms. An analysis has been made of the charge brought down by rain during the passage of 23 thunderstorms over Bombay in the years 1930–32 . . . . The 23 thunderstorms, collectively transferred to each sq. cm. of ground 1·11 E.S.U. of positive charge, and 2·21 E.S.U. of negative charge. Estimating that an area of 100 km.^{2} received charge at the rate recorded at Bombay, it is concluded that on the average each thunderstorm transferred to the ground an excess of about 2×10^3 coulombs of negative electricity.

S. K. B.

76. **BOSE, N. K.**—Floods and Prediction of Flood Levels by River Models. *Science and Culture*, IV, pp. 195–196, (1938).

In this note is described some experiments carried out by the author with the help of river models in connection with the Emerson Barrage Project of the Punjab Irrigation.

J. N. B.

77. **BRUNT, D.** and **KAPUR, A. K.**—Water Vapour in Stratosphere and Upper Troposphere. *Jour. Roy. Met. Soc.*, LXIV, pp. 510–514, (1938).

The authors discuss the problem of humidity mixing ratio in the stratosphere and then derive a simple equation by which the total water vapour content of the stratosphere may be estimated. Calculations made by the authors show that the level above which the amount of precipitable water is 0·3 mm. coincides with an isothermal surface assuming complete or 50% saturation. The effect of the presence of small quantities of water vapour in the stratosphere on the equilibrium conditions of the O_3 layer is also discussed.

J. N. B.

78. **CHATTERJEE, G.** and **SUR, N. K.**—Discussion of Results of Soundings of Temperature and Humidity at Jhikargacha (Bengal) in April and May, 1929. *Mem. Ind. Met. Dep.*, XXVI, Part IX, pp. 165–187, (1938).

The mean monthly dry and wet bulb temperatures in the upper levels of the atmosphere up to 2·5 km. over Jhikargacha in the morning and afternoon in April and May, 1929, obtained from clown balloon meteorographs are tabulated and the general features discussed. The upper air temperatures in the afternoon, obtained from Dines meteorographs, are compared with the corresponding normal values for Agra and Poona. These data are discussed with reference to latent instability in the atmosphere over these regions.

A typical atmospheric condition in this season in lower Bengal is an inversion of temperature in the morning between 0·5 and 1·5 km. above the surface, generally with latent instability in the atmosphere above. This inversion may persist in the afternoon, but often it is wiped out, leading to Nor'westers which occur frequently in the afternoon of this season in Bengal. The existence of latent instability is found to be a necessary though not sufficient condition for the occurrence of thunderstorms in Bengal in these months.

The causes of the cooling of the layers of air on the ground and immediately above it after a thunderstorm have also been discussed with reference to the available data. In the majority of cases the cooling can only be attributed to the cold air descending from the upper levels of the region of the thunderstorm itself.

Some data obtained at Jhikargacha indicate that the flow of a colder mass of air undercutting the originally existing mass of latently unstable air in lower Bengal can start a thunderstorm. From the available data it appears that the places of origin of such a colder mass of air were only the neighbouring regions of thunderstorm. These data are insufficient to investigate the other phenomena that can act as triggers for the outbreak of a thunderstorm in Bengal.

G. C.

79. Doraiswamy Iyer, V. and Sobti, Kasturinath.—Average Intensity of Rainfall on a Rainy Day in India. *Ind. Met. Dep. Sci. Notes*, VII, No. 76, pp. 103–107, (1938).

Monthly charts of the average intensity of rainfall on a rainy day are prepared and discussed. The average intensity associated with winter disturbances is found to be moderate. The intensity increases gradually during the hot weather till a maximum value is reached in the monsoon. During the height of the monsoon the chief feature of the distribution is the contrast between the windward and leeward sides of the mountain ranges. In the retreating monsoon months the area of highest intensity lies along the coast of the Bay of Bengal.

V. D. I.

80. Doraiswamy Iyer, V. and Zafar, Mohammad.—Distribution of Heavy Rainfall over India. *Ind. Met. Dep. Sci. Notes*, VII, No. 77, pp. 109–118, (1938).

Two charts showing the distribution over India of heavy falls of 3″ and above and of 5″ and above in 24 hours are given and briefly discussed. A chart showing the heaviest fall that has occurred in different parts of India is also given; this is followed by twelve monthly charts showing the distribution of the heaviest fall in each month; their chief features are briefly described.

V. D. I.

81. Dutta, A. K.—Electrical Charge Distribution in Thunderclouds. *Science and Culture*, IV, pp. 67–72, (1938).

The polarity of thunderclouds, the methods employed to determine it and also Simpson's experiments on the charge distribution in a cloud are discussed.

J. N. B.

82. Krishna Rao, P. R.—Squalls at Karachi. *Ind. Met. Dep. Sci. Notes*, VII, No. 75, pp. 75–101, (1938).

The paper contains the results of a study of about 50 squalls recorded at the observatory at Karachi Air Port, Drigh Road, during the 7½ years' period, July 1928 to December. 1935. Complete details of the squalls have been given in tabular form after classifying them under four different periods of the year—Winter Period, Summer Period, Monsoon Period and Transition Period. About 7 squalls occur in a year associated with thunderstorms or duststorms or both and are most frequent during the period May to July. They occur generally in the afternoon between 3 P.M. and 9 P.M. in the summer and monsoon periods and during winter they may occur at any time. They are generally associated with a fall of dry and wet bulb temperatures and a rise of pressure, the latter occurring generally a few minutes earlier than the squall. Five main causes of squalls are given and the mechanism discussed briefly with reference to the general meteorological conditions in the different seasons in which they occur. Autographic records of a few squalls have been reproduced and brief descriptions of some typical squalls given in the Appendix.

P. R. K. R.

83. **Krishna Rao, P. R.** and **Bhatia, K. L.**—Temperatures and Humidities up to 3 Kms. over Karachi. *Ind. Met. Dep. Sci. Notes*, VII, No. 78, (1938).

The paper contains an analysis and brief discussion of the temperature and humidity data obtained from observations of dry and wet bulb thermometers taken on aeroplane flights by the R.A.F. at Drigh Road (Karachi) during the seven years 1929–1935. Monthly mean values of temperature, lapse rate of temperature, relative humidity and vapour pressure have been given and their variation with height and with the seasons discussed. The temperatures and humidities over Karachi have been compared with those over Quetta and Peshawar. Mean values of air density have been calculated by utilising the mean monthly pressure at surface at 8 hrs. local time (0902 hrs. I.S.T.) and the mean temperature and relative humidity at different levels. Some significant features revealed by monthly mean tephigrams and wet bulb temperature curves (estegrams) have been mentioned, and the tephigrams and estegrams for June and December reproduced.

P. R. K. R.

84. **Mal, S.** and **Desai, B. N.**—Mechanism of Thundery Conditions at Karachi. *Jour. Roy. Met. Soc.*, LXIV, pp. 525–537, (1938).

Weather conditions and aeroplane ascents at Karachi between June 22 and July 2, 1936 have been examined for understanding the mechanism of thundery conditions which prevailed there during that period. It is observed that thundery conditions occurred when the characteristic monsoon inversion was absent and there was a sufficiently deep layer of air which when raised to a certain level either by insolation, arrival of sea air, or convergence of winds, released an appreciable amount of energy of latent instability.

S. M.

85. **Mukherjee, S. M.**—Atmospheric Electric Potential Gradient, Conductivity and Air-Earth Current on Electrically 'Quiet' Days at Colaba. *Ind. Met. Dep. Sci. Notes*, VII, No. 79, (1938).

Observations of atmospheric electric conductivity carried out at Colaba with a Gerdien apparatus during the period July 1935 to August 1936 have been analysed for diurnal and seasonal changes and correlated with the associated values of potential gradient. Values of air-earth current, computed from these quantities, are also discussed. The results show that during non-monsoon months (October to part of May) conductivity is approximately inverse to potential gradient. The double oscillation of potential gradient during these months is related to the variation in smoke and nuclei concentration, caused predominantly by wind. This inverse relation almost ceases in the monsoon (June to September) when the air supply is directly from the sea and the effect of local pollution is almost absent. The diurnal curve of potential gradient in this period is essentially similar to that over the ocean. In all the seasons, one of the maxima of both potential gradient and air-earth current (18 h. to 19 h. G.M.T.) coincides approximately with the maximum of these elements over the oceans; the mean values of the elements at Bombay are nearly equal to the mean ocean values.

S. M. M.

86. **Normand, C. W. B.**—Instability from Water Vapour. *Journ. Roy. Met. Soc.*, LXIV, pp. 47–69, (1938).

This paper summarises the general criteria for the stability of a particle and of a layer in the atmosphere under conditions when condensation may bring the latent heat of water vapour into play. It discusses briefly the relationship between Feucht-Labilitat (Refsdal), latent instability (Normand) and convective instability (Rossby) and gives the reasons for the introduction in India of the classification based on latent instability. The conditions for latent instability are defined with the aid of the tephigram, and an example is given to show how by generating latent instability within a closed system, *e.g.*, by raising the wet-bulb temperature in the lower layers and leaving all else unchanged, the energy available for transformation into kinetic energy may rise from zero to the equivalent of a wind of 50 mi./hr. throughout the system, without taking account of the energy that may become available from the evaporation of rain-drops, in descending air. If, however, evaporation from rain-drops takes place in the descending air in a thermodynamically efficient manner, the available energy in the closed system of the chosen example is nearly trebled, i.e., the equivalent average velocity rises to more than 90 m.p.h. C. W. B. N.

87. **Normand, C. W. B.**—Instability from Water Vapour. *Journ. Roy. Met. Soc.*, LXIV, pp. 338–340, (1938).

Corrections to the original paper (see preceding Abstract).

88. **Normand, C. W. B.**—Kinetic Energy Liberated in an Unstable Layer. *Journ. Roy. Met. Soc.*, LXIV, pp. 71–74, (1938).

Kinetic energy is released when an unstable superadiabatic layer of constant lapse-rate $\epsilon\Gamma$ rights itself (where Γ is the adiabatic lapse-rate and $\epsilon > 1$). The average kinetic energy can be computed analytically by Margules' method or graphically on the tephigram. By Margules' method a good approximate formula for the resulting average velocity is shown in this paper to be $v = \text{constant} \times \Delta p/\pi\{(\epsilon - 1)\theta\}^{\frac{1}{2}}$, where π and θ are the mean pressure and temperature of the column and Δp is the pressure difference between the top and bottom of the column. The method of the tephigram gives the average energy to be equivalent to one-sixth the area of a parallelogram of which the diagonals are the initial and final temperature curves of the column. Some examples are numerically evaluated by these methods and the results show close agreement with values previously calculated by a longer and more laborious method by Littwin. C. W. B. N.

89. **Paranjpe, M. M.**—Variations of Solar Constant and their Relation to Weather. *Journ. Roy. Met. Soc.*, LXIV, pp. 459–476, (1938).

The determinations of the solar constant obtained by the Astrophysical Observatory of the Smithsonian Institute during the last thirty years are discussed, with results which point to the conclusion that the observed variations are mainly due to the defects in the methods of determining the solar constant. If this conclusion is accepted the subsequent work based on the supposed variability of the solar constant is not valid.

M. M. P.

90. **Raman, P. K.**—Measurements of the Radiation from the Sun and the Sky at Poona in 1935. *Mem. Ind. Met. Dep.*, XXVI, Part VIII, pp. 151-164, (1938).

The paper contains a full account of investigations made by the author on the total radiation from the sun and the sky at Poona. A detailed description of the experimental equipment which consisted essentially of a Mole Solarigraph is given. The observed hourly and seasonal variations of the solar radiation are depicted by means of graphs and tables.

J. N. B.

91. **Sen, S. N.**—Cyclones in Bay of Bengal. *Science and Culture*, III, pp. 458–461, (1938).

The author discusses in detail the formation of cyclones and the air motions involved in them. J. N. B.

92. **Seshachar, C. and Iyer, V. D.**—An attempt at Foreshadowing Monsoon Rainfall in Mysore. *Current Science*, VI, pp. 510-511, (1938).

Formulae for foreshadowing the monsoon rainfall of Mysore have been obtained by utilising the rainfall data for 43 years in the Malnad and Maidan regions. J. N. B.

RADIATION.

93. **ANANTHAKRISHNAN, R.**—Effect of Temperature on the Raman Spectrum of Liquid CCl_4. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 196–207, (1938).

The Raman spectrum of liquid CCl_4 has been studied over a temperature range of 25° to 200°C and the spectral changes noticed are discussed. The integrated intensities of the Stokes lines of CCl_4 seem to show no increase at the higher temperature. It is suggested that the effect of anharmonicity of the nuclear vibrations and the centrifugal stretching of the molecule due to rotation is probably responsible for this departure from the expected increase in intensity.

J. N. B.

94. **ASUNDI, R. K., KARIM, M.** and **SAMUEL, R.**—Emission Bands of $SiCl_2$ and $SnCl_2$. *Proc. Phys. Soc.*, L, pp. 581–598, (1938).

The discharge through flowing vapour of $SiCl_4$, $SnCl_4$ and $SnCl_2$ shows a number of regions of selective continuous emission, and, intimately connected with them, several sets of new bands. These appear under conditions unfavourable for the production of the known bands of SiCl and SnCl respectively. They are broad and diffuse, and have not the appearance of bands due to a diatomic emitter of low molecular weight. They are quite different from the known SiCl and SnCl bands as far as the anharmonic factor of the ground level of the molecule is concerned. They are therefore attributed to the triatomic molecules $SiCl_2$ and $SnCl_2$ respectively. An analysis carried out on this assumption reveals two excited electronic levels of $SiCl_2$ ($\nu\nu = 28295$ and 29952), and one of $SnCl_2$ ($\nu = 22237$). The presence of the deforming (breathing) vibration ω_1 and of the symmetrical valence vibration ω_2 are indicated both in the ground state and in the various excited states. The antisymmetric valence vibration is absent, in agreement with Herzberg-Teller's solution rules. For certain reasons ω'_2 is smaller than ω''_2, despite ω' being larger than ω'' in the corresponding excited terms of SiCl and SnCl. The energies of excitation and the values of ω''_2 of $SiCl_2$ and $SnCl_2$ show a close similarity to the corresponding constants of SiCl and SnCl respectively, and also the bond energies appear to be rather unaffected by the transition from the diatomic to the triatomic molecule. The later ones appear to be triangular.

R. K. A.

95. **ATHAVALE, V. T.** and **JATKAR, S. K. K.**—Refractive Dispersion of Oils and Fats. *Jour. Ind. Inst. Sci.*, XXI, pp. 15–25, (1938).

The refractive dispersions of butterfats from different sources have been measured on a Pulfrich refractometer and the dispersion constants are found to be sufficiently different from those of vegetable oils to account for the characteristic colour fringes on a simple type of butyro-refractometer. The authors suggest that by the measurement of both refractive index and dispersion on Pulfrich refractometer, using the green and violet lines of the Hg arc, it should be possible to detect adulteration of ghee.

J. N. B.

96. **BALANKESWARARAO, A.** and **KRISHNAMURTY, S. G.**—The Third Spectrum of Krypton Kr. IV. *Current Science*, VI, p. 329, (1938).

Highly condensed discharges through Krypton gas at various pressures were photographed with the help of a large Quartz Littrow Spectrograph. A few of the important lines identified are recorded in this note.

J. N. B.

97. **BHABHA, H. J.**—Penetrating Component of Cosmic Radiation. *Proc. Roy. Soc.*, CLXIV, Ser. A, pp. 257–294, (1938).

An analysis of the experimental data is carried through to show that a 'breakdown' theory for radiation loss of electrons cannot explain: (1) the latitude effect at sea level from latitudes of 35–50°, (2) the large number of particles found at sea level in the difference curves of Bowen, Millikan and Neher for charged particles of 10^{10} eV, (3) the shape of the transition curve for large bursts. All these facts can be explained by assuming that the penetrating component consists of new particles with masses between those of the electron and proton. But in order to explain the energy loss measurements of Blackett and Wilson, it must then be assumed that these particles suffer large energy losses in addition to the ordinary Bremsstrahlung which must vary in different substances as Z rather than Z^2, such as, for example, a change in the rest mass of the particles. The radiation loss and the pair-creation cross-sections are calculated taking screening into account accurately for 'heavy' electrons. The frequency of the production of showers of different sizes by such heavy electrons as also the intensity of electrons in equilibrium with such particles forming a soft component are also calculated, and it is shown that though both these are somewhat larger in heavier elements, the variation is much less than a Z^2 law would give. A comparison with experiment gives the mass of the penetrating particles as of the order $100m$. If such heavy electrons can be created as usual in pairs, then a part of the hard component at sea level could consist of heavy electrons of mass $10m$. created by the soft component in the upper atmosphere. It is shown that there are reasons to suppose that the uppermost layers of the atmosphere are more absorbing than should be expected, from their mass. This may be due to the fact that the atoms in these layers are largely ionised, thus increasing the effective radiation and pair-creation cross-sections.

H. J. B.

98. BHAGAVANTAM, S. and RAO, B. S. R.—Light-Scattering and Allied Properties of H_2O and D_2O. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 35–37, (1938).

In order to compare the intensities of the transversely scattered light in H_2O and D_2O, the adiabatic compressibility and depolarisation have been measured at the laboratory temperature. The isothermal compressibility is calculated with the help of the thermodynamic relation and figures show that the relative scattering powers of D_2O and H_2O should be as 1·8 : 2. This is in good agreement with the ratio obtained experimentally by photographing the tracks of the transversely scattered light using the $\lambda 4358$ radiation from a mercury point source lamp. Ratio of β_T to β_ϕ in D_2O is very nearly unity as in the case of H_2O.

S. B.

99. BHAGAVANTAM, S.—Specific Heats of Liquids in Relation to Raman Effect Data. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 245–250, (1938).

The specific heats of liquid benzene, CCl_4 and CS_2 are calculated with the help of the known fundamental frequencies in each case at different temperatures. Two alternative methods of evaluating the contribution to specific heat of translational and rotational degrees of freedom are adopted. In the first, a Debye function is assumed as in the case of a solid, and in the second, a mean energy of $kT/2$ per degree of freedom per molecule is assigned as in the case of a gas. The observed specific heats are found to lie between these two extremes. It is therefore concluded that in liquids thermal movements of molecules are partly in an organised manner constituting Debye elastic waves as in a solid and partly in a random manner as in a gas.

S. B.

100. BHAGAVANTAM, S.—Interpretation of Raman Spectra in Crystals: Anhydrite and Gypsum. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 345–348, (1938).

Application of the group theory to a study of the normal oscillations of the crystal lattices of anhydrite and gypsum shows that the degenerate modes of the free SO_4 ion would be expected to split up completely in the crystal. All the split components are Raman active. The experimental results obtained with anhydrite are in entire agreement with this view. The case of gypsum also gives results which are in general agreement with the theory. The splitting is a consequence of the lower symmetry of the crystals as a whole and need not be taken as indicating a lack of tetrahedral symmetry for the SO_4 ions individually.

S. B.

101. BHAGAVANTAM, S. and VENKATARAYUDU, T.—Normal Modes and Frequencies of the Sulphur Molecule. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 101–114, (1938).

The normal modes and frequencies of the sulphur molecule have been worked out on the assumption that the eight atoms in the molecule occupy the corners of a puckered octagon. There are eleven modes of which four are single and seven are doubly degenerate. Two of the former type and five of the latter type are Raman active. One is inactive in both Raman and infra-red spectra and the others are active only in infra-red absorption. The results obtained in respect of the Raman effect of sulphur are in agreement with the above conclusions. Detailed expressions are derived for the normal frequencies by postulating three types of forces, namely, primary valence, directed valence and repulsive forces.

S. B.

102. BHAGAVANTAM, S. and VENKATARAYUDU, T.—Raman Spectrum and Specific Heat of Sulphur. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 115–118, (1938).

Using the expressions derived for the vibrational frequencies of sulphur (see preceding Abstract) the force constants K_1, K_2 and K_3 referring respectively to primary valence, directed valence and repulsive forces are evaluated. The values obtained are $K_1 = 2{\cdot}309 \times 10^5$ dynes/cm.; $K_2 = 0{\cdot}903 \times 10^{-11}$ dyne cm./radian and $K_3 = 0{\cdot}06665 \times 10^5$ dynes/cm. The frequencies calculated on the basis of these constants are compared with the observed Raman lines and infra-red absorption maxima and satisfactory agreement is obtained. The specific heat of sulphur is represented as the sum of a Debye function and a number of Einstein functions associated with the various normal frequencies. The calculated values compare favourably with the observed specific heats.

S. B.

103. BHAGAVANTAM, S. and VENKATARAYUDU, T.—Normal Frequencies of Phosphorous (P_4). *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 119–123, (1938).

Assuming a potential energy function based on primary valence and directed valence forces, expressions are obtained by group theoretical methods for the normal frequencies of the tetrahedral molecule P_4. The numerical values of the observed frequencies are in agreement with the theoretical expressions and yield $K_1 = 1{\cdot}68 \times 10^5$ dynes/cm. and $K_2 = 0{\cdot}396 \times 10^{-11}$ dyne cm./radian for the primary valence and directed valence force constants respectively. On the assumption that this value of K_1 refers to single bond, the oscillation frequency that is to be expected of $P = P$ molecule is calculated as 742 and compared with the value 779 obtained from band spectra. The calculated specific heat at 9°C is 19·8 cal. which is in good agreement with the experimental value, namely 22·0 cal.

S. B.

104. BONINO, G. B. and MANZONI-ANSIDEI, R.—Raman Spectra of Paraffin Hydrocarbons. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 405–418, (1938).

The Raman spectra of several hydrocarbons and their aliphatic compounds are studied. It is shown that there are distinct differences in the Raman spectra of hydrocarbons with and without side chains.

J. N. B.

105. BOSE, D. M. and MUKHERJI, P. C.—Origin of Colour of Paramagnetic Ions in Solution. *Phil. Mag.*, XXVI, pp. 757–776, (1938).

The authors have collected the available data on the absorption spectra of paramagnetic ions in solution, excluding rare-earth ions. On the basis of certain assumptions they have given an empirical formula for the number and frequency of the principal absorption bands.

J. N. B.

106. BOTHE, W.—Hard Cosmic Ray Showers. *Ind. Journ. Phys.*, XII, pp. 155–162, (1938).

Lecture delivered at the annual meeting of the Indian Physical Society at Calcutta.

J. N. B.

107. **Burkard, O.**—Vibrations of Selected Molecular Models. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 365–382, (1938).

The paper gives the frequency, mode of vibration and energy distribution for plane vibrations in certain compounds in terms of the model constants.
J. N. B.

108. **Chakravorty, S. K.**—Spectrum of a Diatomic Molecule and the Calculation of the Dissociation Energy. *Zeits. f. Physik*, CIX, pp. 25–38, (1938).

The heat of dissociation of certain substances are calculated by an approximate method from spectral constants by applying a particular kind of perturbation theory to the vibrations and rotations of a molecule.
J. N. B.

109. **Chakravorty, S. K.**—Stark Effect in Rotation Spectra. *Zeits. f. Physik*, CX, pp. 688–691, (1938).

The author has explained a discrepancy between the values of the term for second order stark effect in rotation spectra as obtained by himself and by Manneback.
J. N. B.

110. **Dass, I. N. D.** and **Dutt, S.**—Colour in Relation to Chemical Constitution. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 145–159, (1938).

Diphenyl-thio-violuric acid has an orange colour in the solid state or in solution in organic solvents, but on treatment with alkalies or organic bases, intense blue and green coloured salts are formed, the transition of colour being sufficiently strong and sharp for the substance to act as an excellent indicator. The change of colour from orange to blue or green has been shown from theoretical considerations to be due to a fundamental change in the constitution of the molecule from an oximino-ketonic to a nitrosoenolic structure. The above change in the molecular structure results in the production of a true nitroso-group, which from the point of view of a theory of colour on the basis of molecular strain advanced by Dutt, has been shown to be the most highly strained amongst the chromophoric groups, and consequently produces the greatest intensity of colour. The loading effect of the two phenyl groups as well as that of the S atom from the point of view of colour production is discussed, and it is shown that the effect is quite in accordance with the theory. From a study of the absorption spectra of the salts of diphenyl-thio-violuric acid it has been found that their intensity of colour is roughly proportional to the strength of the basic character of the base entering into salt formation. Further study of the absorption spectra of the salts of a series of newly synthesised higher homologues and analogues of diphenyl-thio-violuric acid indicates that the effect of additional load on the molecule of the substance is to produce still further intensification of colour as expected from theoretical considerations, the greatest effect being produced by substituents in meta-positions closely followed by those in the para.
I. N. D. D.

111. **Datta, S.**—Absorption Spectra of $CoCl_2$ Vapour. *Science and Culture*, III, p. 495, (1938).

The absorption spectra of $CoCl_2$ vapour have been investigated at temperatures up to 1000°C and the results obtained are discussed.
J. N. B.

112. **Ghosh, R. C.**—Angular Distribution of Electron Pairs. *Science and Culture*, IV, pp. 61-62, (1938).

The author describes an arrangement for the determination of the angular distribution of electron pairs. The experimental results show that there is a definite maximum corresponding to an angle of 20°.
J. N. B.

113. **GHOSH, R. C.**—On the North-South Asymmetry of Cosmic Rays. *Science and Culture*, IV, pp. 62-63, (1938).

The note reports results of observations on the north-south asymmetry of cosmic rays. The experiment was carried out with three Geiger-counters by the method of coincidence. No point of dip, as observed by Johnson, could be detected even with an angular interval of 15°.

J. N. B.

114. **GUPTA, J.**—The Origin of Low Frequency Raman Lines in Solids. *Ind. Journ. Phys.*, XII, pp. 355–362, (1938).

Following a previous communication on the subject, observations with the Raman spectra of tartaric acid, sodium tartrate and benzophenone crystals have been recorded, which go against the possibility of the new lines being due to lattice oscillations. The specific heat values of carbon disulphide at low temperatures have been found to agree closely through a long range of temperatures with those derived from the new frequencies of the substance in the solid state, by taking those as Einstein and not Debye frequencies.

J. G.

115. **HIBBEN, J. H.**—Statistical Analysis of Trends in Research on Raman Effect. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 294–300, (1938).

There are outlined in this presentation, the trends, during a ten-year period, in interest in the Raman effect as a function of time and geographical distribution. The interest in particular types of organic and inorganic compounds is evaluated, and the reasons for preferential treatment of certain classes and compounds are discussed briefly.

J. H. H.

116. **KRISHNAMURTY, S. G.** and **SANJIVARAO, R.**—The Spectra of Iodine V and I, VI. *Current Science*, VI, p. 329, (1938).

Using a Quartz Littrow Spectrograph, the spectrum of a highly condensed discharge through iodine vapour has been obtained. As many as thirteen terms due to I, VI were identified.

J. N. B.

117. **KRISHNAN, R. S.**—Reciprocity Theorem in Colloid Optics. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 91–97, (1938).

The effect of orientation of the particles on the reciprocity relation as well as on the intensity and state of polarisation of the scattered light as well as on the intensity and state of polarisation of the scattered light has been studied for the case of graphite sol. Magnetic fields were employed as the external orientating agency. The depolarisation factors, ρ_u, ρ_v and ρ_h of the transversely scattered light have been measured with the magnetic field: (1) perpendicular to the incident beam and the direction of observation, (2) parallel to the direction of observation, and (3) parallel to the direction of the incident beam. The values of ρ_u, ρ_v and ρ_h are found to satisfy the reciprocity relation only when the magnetic field is perpendicular to both the incident and the scattered beams. In the other two cases the reciprocity relation is not satisfied. Marked changes are observed in the intensities of the components $\overline{V}_v$, $\overline{H}_v$, $\overline{V}_h$ and $\overline{H}_h$ and also in the values of ρ_u, ρ_v and ρ_h.

R. S. K.

118. **KRISHNAN, R. S.**—Light-Scattering in Emulsions. Part I. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 98–103, (1938).

Measurements of the depolarisation factors ρ_u, ρ_v and ρ_h have been made in some typical dilute simple emulsions. Two methods have been employed for the preparation of these emulsions: (1) by boiling a mixture of water and a few drops of the oil, and (2) by pouring an alcoholic solution of the oil into a large quantity of water. The values of

ρ_v and ρ_h are of the order of 0·5 and 2% respectively for most of the emulsions. Depolarisation measurements indicate that the droplets in the emulsions prepared by the first method are bigger in size than those in the emulsions prepared by the second method. The depolarisation factors exhibit appreciable dispersion. It is shown that the droplets in dilute simple emulsions are spherical in shape and that the observed finite values of ρ_v and ρ_h are due to the existence of depolarised secondary scattering.

R. S. K.

119. Krishnan, R. S.—Anomalous Depolarisation of Light-Scattering in Optical Glasses. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 442–447, (1938).

An experimental method based on photographic photometry is described for demonstrating the existence of anomalous depolarisation, *i.e.*, ρ_h less than unity, in optical glasses. Microphotometric records are reproduced which clearly show the existence of anomalous depolarisation in optical glasses. Three typical glasses are examined. The experiment was repeated with ether as the scattering substance and a negative result was obtained showing thereby that there was no defect in the experimental technique.

R. S. K.

120. Mahanti, P. C. and Sen Gupta, A. K.—The Band Spectrum of Tin Monoxide. Part III. The Rotational Analysis of the A-bands. *Zeits. f. Physik*, CIX, pp. 39–51, (1938).

From measurements on high dispersion spectrograms a rotational structure analysis has been made of the (1, 0), (0, 0) and (0, 1) bands of the A system of tin monixide (SnO). The bands are found to be due to a $^1\Sigma \rightarrow {}^1\Sigma$ transition. The lower $^1\Sigma$ state is the ground state of the molecule and arises from Sn(^3P) and O(^3P). The relevant molecular constants in the two states have been obtained.

The structure lines of the (0, 1) band are in most cases split up into three components and promise a quantitative determination of the isotope effect in tin.

P. C. M.

121. Mitra, S. M.—Raman Effect in Boric Acid and some Boron Compounds. *Ind. Journ. Phys.*, XII, pp. 9–14, (1938).

The paper gives the results obtained from the author's investigations on Raman effect in boric acid and other borates. In the case of the boric acid solution the frequencies 515, 872 and 986 cm.$^{-1}$ and in the case of the solid powder the frequency 882 cm.$^{-1}$, in addition to the two broad lines at 3195 and 3290 cm.$^{-1}$ due to the vibrations of O-H, were observed. Presumably therefore the molecule $B(OH)_3$ has a symmetry D_{3h}.

The results obtained in the case of methyl borate, ethyl borate and butyl borate are also included in the report.

S. M. M.

122. Mitra, S. M.—Raman Effect in Solid Cyclohexane. *Phil. Mag.*, XXV, pp. 895–899, (1938).

The paper describes the results obtained in the author's investigation on the Raman effect in solid cyclohexane. Each of the lines at 1266, 1437 cm.$^{-1}$ in the case of liquid seems to split up into two in the case of the solid. The line at $\Delta\nu = 2922$ cm.$^{-1}$ broadens, and the other lines found in the case of the liquid appear more or less in the same positions. Two new lines of $\Delta\nu = 60$ and 105 cm.$^{-1}$ also appear in the solid state.

S. M. M.

123. Mookerjee, B. K.—On Anomalous Depolarisation of Light Scattered by Binary Mixtures. *Ind. Journ. Phys.*, XII, pp. 15–24, (1938).

The distribution of intensity in the 'wing' of the Rayleigh line due to a binary mixture of CS_2 and CH_3OH at the critical solution temperature as well as the dependence of the value of ρ_h of the light scattered by a similar mixture of phenol and water on the shape of the illuminated volume have been experimentally investigated. The results do not seem to support the theory of formation of 'clusters' put forward by Krishnan.

B. K. M.

124. **Moureu, H., Magat, M.** and **Wetroff, G.**—Raman Spectrum and Structure of PCl_5. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 356–364, (1938).

The authors describe in detail results of investigations on the Raman spectrum of PCl_5 as solid, liquid, vapour and also in solution in PCl_3 and CCl_4. The structure of the molecule is also discussed.
J. N. B.

125. **Mueller, H.**—Light Scattering in Anisotropic Media. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 267–274, (1938).

The theory of Brillouin scattering of light in an optically anisotropic medium is developed. The influence of a uniform elastic strain on the intensity and the depolarisation factors of the light scattered by glass are calculated. These quantities change rapidly when the forced birefringence reaches a magnitude of the same order as the optical fluctuations within the glass. They reach definite saturation values for large strains. The results are analogous in many respects to those observed for scattering in a graphite sol under the influence of a magnetic field.
H. M.

126. **Mukerji, S. K.**—Fine Structure of First Spark Spectrum of Arsenic in the Visible Region. *Ind. Journ. Phys.*, XI, pp. 377–392, (1938).

The hyperfine structures in the majority of the stronger lines of the first spark spectrum of arsenic in the visible region have been measured and analysed. The source used was a hollow-cathode discharge tube containing arsenic in which helium was continuously made to circulate at a low pressure. The structures have been measured by means of a quartz Lummer plate in conjunction with a Hilger's glass spectrograph. The analysis has definitely shown that the nuclear spin of arsenic is 3/2.

The terms investigated are those belonging to $4s^2 . 4p \cdot 5s$. and the $4s^2 . 4p . 5p$. electron configurations found in most of the lines in the visible region. Fine structure interval factors have been calculated for 14 terms belonging to the above electron configurations. In addition, the structures of the terms $sp\,^{33}D_2$, and $sp\,^{33}D_3$ have been determined. The structures of the terms $4d . ^1D_1$, $4d . ^3D_1$ and $4f . ^3F_2$ have also been estimated.

The fine structure analysis also confirms the gross structure analysis.
S. K. M.

127. **Mukerji, S. K.**—On the Hyperfine Structure and Analysis of some Complex Lines in the First Spectrum of Arsenic in the Ultra-violet Region. *Ind. Journ. Phys.*, XII, pp. 331–340, (1938).

All the important lines in the region λλ 3200–2400 of the first spark spectrum of arsenic emitted by a water-cooled hollow cathode discharge have been investigated, with a quartz Lummer plate, for hyperfine structure. An attempt has been made to analyse the incompletely resolved and complex lines, assuming the nuclear spin of arsenic to be 3/2 as previously determined. An estimate has also been made of the values of the fine-structure intervals and the term interval factors of the lines investigated. One of the unclassified lines has shown an inverted structure. Fine structure perturbation effect is suspected in one of the partially classified lines.
S. K. M.

128. **Mukerji, S. K.**—Raman Spectra of Compounds with Three Benzene Rings. *Nature*, CXLII, p. 477, (1938).

Raman spectra of *o*-diphenyl benzene and *m*-diphenyl benzene have been obtained for the first time by the author. A large number of new lines has been recorded in both cases.
J. N. B.

129. **Mukerji, S. K.** and **Aziz, S. A.**—On the Raman Spectrum of Diphenyl. *Ind. Journ. Phys.*, XII, pp. 271–282, (1938).

The Raman spectrum of molten diphenyl has been studied carefully with a view to record and assign correctly the faint Raman lines. A few new lines not observed by previous workers have been recorded by carefully suppressing the continuous background with the help of suitable filters. It is pointed out that most of the ground frequencies of benzene are also observed in the case of diphenyl and that the characteristic frequency due to the C—C binding between the two benzene nuclei is 1283 cm.$^{-1}$

S. K. M.

130. **Mukherji, P. C.**—On Possible Electronic Transitions in Pr^{+++} ions and the Absorption Spectra of the same in Solution. *Ind. Journ. Phys.*, XI, pp. 399–408, (1938).

The absorption spectra of Pr^{+++} ions in solution and in crystals have been investigated here over the region from 900 $m\mu$ to 200 $m\mu$. In solution the intensity of absorption has been measured over the visible region with a double monochromator. Using large single crystals of $PrCl_3$, $7H_2O$, the changes brought about at liquid air temperature in the nature of the different groups of absorption lines and bands have been studied. A preliminary classification of these groups of absorption lines and bands is given based on the assumption that they are due to inner forbidden transitions. Every transition is supposed to give rise to a group. In this process of classification the term values of Pr IV have been calculated from those of La II and compared with the mean frequencies of the different groups obtained in absorption. The Van Vleck's theory of the absorption spectra of rare earths in solids has been discussed. A scheme of classification of the rare earth spectra presented by Ellis has been noted and the divergences explained.

P. C. M.

131. **Mukherji, P. C.**—Diffuse Fluorescence Spectra of the Ions of the Rare Earths in Solution and in Crystals. *Zeits f. Physik*, CIX, pp. 573–585, (1938).

The author has obtained the fluorescent spectra of the trivalent ions of La, Ce, Pr and Nd in solution, in crystals and also in dehydrated crystals. These spectra have been studied in detail and the observations are reported in this paper. There is a wide diffuse band in the spectrum of all these ions in solution. Besides this, Pr and Nd ions emit two weaker bands of shorter wavelength and Nd another of greater wavelength. It has been observed that La ions in crystal form do not fluoresce while the number of bands from Ce depends both on the anion and also on the frequency of the exciting radiation. The author discusses at length the results observed and offers an interpretation of the same.

J. N. B.

132. **Nadungadi, T. M. K.**—Scattering of Light in Sodium Nitrate Crystals. Part I. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 397–404, (1938).

A detailed study of the Raman spectrum of $NaNO_3$ at a series of temperatures ranging from 25°C. to 290°C. has been carried out with fairly large single crystals prepared from melts of the substance. The investigation has also been extended to the case of the substance in the molten state. The most interesting effect noticed is the simultaneous broadening and shifting towards the exciting radiation of the lines due to lattice oscillations with rising temperature. The symmetrical oscillation of the nitrate ion shows a shift of 4 wave numbers at 290°C. The 1385 line broadens out considerably as compared with the 720 line. The spectrum of the molten substance shows an intense wing accompanying the Rayleigh line similar to those exhibited by aromatic liquids. The 1385 line observed in the crystal becomes a broad band extending over 160 wave numbers in the molten substance.

T. M. K. N.

133. **Nag, N. C.**—Absorption Spectra of Rare Earth Salts of Ranchi Allanite and Gaya Monazite. *Science and Culture*, III, pp. 678–679, (1938).

Absorption spectra of rare earth salts obtained from two minerals, allanite from Ranchi and monazite from Gaya, have been photographed by means of a direct vision diffraction grating spectroscope and the resemblance between the two has been pointed out.

J. N. B.

134. NAYAR, P. G. N. Raman Spectrum and Constitution of Pentaerythritol. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 251–255, (1938).

The Raman spectrum of pentaerythritol is studied in the solid state and 21 frequencies observed. The molecule is shown to possess tetrahedral symmetry in agreement with recent X-ray studies, and the frequencies are discussed with reference to the 'neopentyl group' and the frequencies in other aliphatic alcohols. The O-H frequency is found to be characteristic of the presence in the crystal of the linking of molecules by the 'H bond'.

P. G. N. N.

135. NAYAR, P. G. N.—Chart of Raman Bands of Water in Crystals. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 419–423, (1938).

A study of the Raman bands due to water of crystallisation in 16 different substances has been made, and the results are presented in the form of a chart along with the earlier data available from the work of Ananthakrishnan.

P. G. N. N.

136. PATTABHIRAMAYYA, P.—Raman Effect in Sodium Nitrate. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 229–234, (1938).

The Raman spectrum of a large single crystal of $NaNO_3$ is obtained at room-temperature and at about 280°C. The frequency of the principal line at the high temperature is found to be about 3 to 4 wave-numbers smaller than that at room-temperature. Of the two lattice oscillations 185 and 95, the former is more intense at room-temperature, whereas the latter is more intense at the high temperature. The results obtained by the earlier workers in respect of solutions are confirmed. It is further reported that with increasing dilution, the frequency 730 gains considerably in intensity when compared with the frequency 1400. In this respect the nitrate ion solution resembles the carbonate ion in the solid state.

P. P.

137. PATTABHIRAMAYYA, P.—Dispersion and Optical Anisotropy of Molecular Oxygen in Relation to its Absorption Spectrum. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 235–244, (1938).

A new dispersion formula for gaseous oxygen has been worked out, which is simultaneously able to explain the observed optical anisotropy of O_2 and its dispersion. The characteristic frequencies found are λ695 and λ970 in the Hopfield absorption band region, λ1831, λ1903 and λ1971 in the Schumann region and λ2429 in the region of the Herzberg bands. The two frequencies found in the Hopfield band region are alone sufficient to explain the dispersion between $\lambda\lambda$5500 to 3500 and give depolarisation of scattered light of 6·68% at λ5500 in good agreement with the observed depolarisation of 6·5% using white light. The frequencies used to explain the dispersion are all from those of actually observed absorption bands in the spectrum of O_2. In no case is it necessary to choose any frequencies from the regions of continuous absorption. The constant associated with the frequencies λ695 and λ970, *viz.*, 2·7798, yields a value of the number of the dispersion electrons of 3·5, while the *f*-numbers associated with $\lambda\lambda$695 and 970, λ1847 and λ2429, *viz.*, 2·7332, $2{\cdot}23 \times 10^{-2}$ and $1{\cdot}4 \times 10^{-4}$ respectively, are in consonance with the vibrator intensities which explain the relative ease with which the various absorption bands can be developed.

P. P.

138. RAMAN, C. V. and SUBBARAMIAH, K.—Interference Patterns with Liesegang Rings. *Nature*, CXLII, p. 355, (1938).

The authors have presented a striking photograph of interference phenomena obtained with silver chromate rings in gelatin.

J. N. B.

139. **Raman, C. V.** and **Venkateswaran, C. S.**—Optical Observation of the Debye Heat Waves in Crystals. *Nature*, CXLII, p. 250, (1938).

Photographs have been obtained for the first time showing unmistakably the physical reality of the Debye heat waves in crystals.

J. N. B.

140. **Raman, C. V.** and **Venkateswaran, C. S.**—Coherent Modified Scattering of Light. *Nature*, CXLII, p. 1116, (1938).

The authors put forward some theoretical considerations which indicate that the modified radiations scattered from the particles in a medium may not necessarily be incoherent with each other. It is pointed out that coherence is possible and that it may play a very important part in the scattering of light with altered frequency.

J. N. B.

141. **Rao, A. B.**—The Spectrum of Argon IV. *Ind. Journ. Phys.*, XII, pp. 399–406, (1938).

The spectrum of argon has been investigated under several experimental conditions in the near ultra-violet and visible regions. An examination of the data obtained enabled the extension of the analysis of the spectrum of the trebly ionised atom of argon into the visible and the near ultra-violet regions. A dozen terms have been newly discovered in the present investigation involving the classification of about 30 lines.

A. B. R.

142. **Rao, A. V.**—Effect of Oblique Refraction at the Prism Surfaces on the Relative Intensities of Raman Lines. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 208–213, (1938).

The effect of the polarisation introduced by oblique refraction at the prism faces in a spectrograph on the relative intensities of Raman lines is discussed. It is shown that if illumination from the side is adopted, the intensity of the well-polarised lines is apparently diminished in relation to the unpolarised ones and the reverse if illumination from the top is adopted. A particularly striking illustration is provided in the Raman spectrum of CCl_4.

A. V. R.

143. **Rao, B. S. R.**—Raman Spectrum of Benzene under High Dispersion and the Isotope Effect. *Journ. Chem. Phys.*, VI, pp. 343-344, (1938).

The Raman spectrum of benzene has been photographed using a fine slit and a high dispersion glass Littrow spectrograph. The faint companion at 984 cm.$^{-1}$ is found to possess an intensity ratio of 6 : 100 when compared with the principal Raman line at 992 cm.$^{-1}$. The view that this satellite arises from a benzene molecule in which one of the C atoms is replaced by C^{13} is supported by this result. The distribution of intensity in the 3048 and 3062 Raman lines has been determined and the contours of the lines are drawn separately. The peaks of these two lines are found to be in the ratio of 1 : 1·35. The relatively sharp nature of 3062 and the diffuseness of 3048 are correlated with the facts that the former is a well-polarized Raman line whereas the latter is a fully depolarized line.

B. S. R. R.

144. **Rao, I. R.** and **Koteswaram, P.**—Additional Raman Frequencies for Water. *Phil. Mag.*, XXV, pp. 90–98, (1938).

A number of workers have reported the following Raman frequencies for water:—60, 175, 500, 700, 1650, 2150, 3200, 3400, 3600, 4023, and 5100. A critical study of the intensity and frequency values of the Raman bands of water, in both the visible and u.v. regions of the spectrum, reveals that all these are not bands of different Raman frequencies excited by the same Hg line, but correspond to the same principal Raman band of water of frequency 3200–3600 arising out of different strong lines of the Hg arc, the excitation by which was ignored by them. The only genuine frequency other than this is at 1650 which happens to be the other fundamental for water.

I. R. R.

145. **Saksena, B. D.**—Raman Spectra of Organic Bi-Cyclic Compounds. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 73–100, (1938).

The Raman spectra of naphthalene, decaline, tetralin, indene, *trans*-β-decalone and *trans*-β-decalol have been studied, the last two for the first time. Polarisation measurements have also been made in the case of all these compounds excepting *trans*-β-decalol. The molecular structures of decaline, tetralin and naphthalene have been studied in the light of polarisation data and the symmetries of the molecules. The results indicate a puckered structure for tetralin, and a centro-symmetric structure for naphthalene. In decaline the *cis* and *trans* lines have been separated; the observed polarization characteristics of these forms agree with the group theory results. The determination of the values of ρ for all these substances has been made for the first time and the results are given in tables.

B. D. S.

146. **Sibaya, L.**—Scattering of Light in a Rochelle Salt Crystal. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 393–396, (1938).

Definite experimental proof of the presence of Debye waves in solids is obtained by a study of the structure of the Rayleigh lines scattered by Rochelle salt.

J. N. B.

147. **Sidhu, S. S.**—X-Ray Investigation of the Form of Acetylsalicylic Acid in Certain Sugars. *Journ. App. Phys.*, IX, pp. 546–550, (1938).

X-ray studies of samples made of sucrose, glucose, and acetylsalicylic acid were made to determine if the latter is in solid solution with the sugars. The main constituent of the samples was sucrose and the amounts of acetylsalicylic acid varied from 1·5 to 20%. The samples were prepared by melting and heating the sugar combinations to 160°C., removing essentially all the water and allowing to cool. The acetylsalicylic acid was then incorporated in one set of samples at 140°C. and in another at a temperature between 110–115°C., that is, both above and below the melting point (133–5°C.) of the compound. The former samples were far more hygroscopic than the latter, but in neither case did the acetylsalicylic acid seem to form a solid solution with the rest of the constituents.

S. S. S.

148. **Sirkar, S. C.** and **Bishui, I. C.**—On the Raman Spectra of Mixed Crystals. *Ind. Journ. Phys.*, XI, pp. 417–426, (1938).

The Raman spectra of mixed crystals of *p* dichlorobenzene and *p*-dibromobenzene have been re investigated. It is pointed out that the observed facts, which are at variance with some of those observed by Vuks, do not definitely lead to the conclusion that the new intense Raman lines having values of Δ^2 less than 100 cm.$^{-1}$ observed in these cases are due to lattice oscillations. It is pointed out that besides these investigations of the Raman spectra, investigations of other properties of the crystals have to be made before coming to the conclusion mentioned above.

S. C. S.

149. **Sirkar, S. C.** and **Gupta, J.**—On the Origin of New Raman Lines due to Molecules in the Solid State and of the Wing due to Liquids. *Ind. Journ. Phys.*, XII, pp. 35–46, (1938).

The results of further investigations on the origin of the new Raman lines observed in the low frequency region in the case of some organic crystals are reported and these results as well as those observed previously are discussed in detail. The present investigations consist in the study of (1) the directions of extinctions in a single crystal of *p*-dichlorobenzene at the room temperature and at a temperature below 12°C. with the rays parallel to the 'b' axis and of (2) the Raman spectra of polycrystalline masses of toluene, dichloroethylene (*cis* and *trans*), ethylene dichloride and xylene at the temperature of liquid oxygen.

It is observed that the directions of extinctions remain respectively parallel and perpendicular to the *a*-axis at both the temperatures. This fact disproves the hypothesis put forward by Vuks that the orientation of the molecules changes with the change of temperature.

The results of the study of the Raman spectra show that intense new Raman lines are observed in the case of the centro-symmetrical molecules in the solid state but no such lines are observed with any appreciable intensity in the case of solid toluene, although, as this molecule has no centre of symmetry, the restoring force is asymmetric during lattice oscillation. From these results it is concluded that the new lines are not due to lattice oscillations.

As regards the conclusion arrived at by other workers that the 'wing' due to liquids and the new Raman lines mentioned above have the same origin, *viz.*, lattice oscillations, it is pointed out that observed facts do not support such a conclusion, because the large aggregate intensity of the wing, the distribution of intensity in it and also the extent of the wing cannot be explained by assuming that the new lines observed in the solid state spread out to produce the wing in the liquid state. S. C. S.

150. VAIDYA, W. M.—Flame Spectra of Aliphatic Halides. Part II. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 321–326, (1938).

Bands corresponding to IO, occurring in the flame of methyl iodide, have been obtained in the flame of ethyl bromide. The experimental evidence and the vibrational analysis are in favour of BrO being the emitter of these bands. Also a large number of bands in the yellow-range have been shown to be due to Br_2. W. M. V.

151. VENKATARAYUDU, T.—Normal Frequency of Diamond Lattice. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 349–352, (1938).

The diamond lattice has only one limiting normal mode of oscillation. In this mode the two interpenetrating lattices oscillate against each other, the direction of oscillation being arbitrary. The corresponding frequency is active in the Raman effect and inactive in infra-red absorption. The fact that only one Raman line possessing a very large intensity is obtained is in agreement with the above results. The weaker lines and also the infra-red absorption maxima are to be regarded as secondary effects. T. V.

152. VENKATESWARAN, C. S.—Hydroxyl Frequency in the Raman Spectra of Acids and Acid Salts. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 13–20, (1938).

The Raman spectra of H_2SO_4, HIO_3, H_2SeO_3, H_6TeO_6, NaH_2PO_2 and $KHSO_4$ have been obtained under long exposure and using complementary filters. In every case, a band characteristic of the O-H group has been recorded. The band is weak and diffuse, and is shifted to a frequency considerably lower than that due to free O-H group. The results are discussed in relation to electrolytic dissociation and molecular structure of these compounds. From the nature of the spectra, the characteristic features of the Raman band due to the so-called H bond are deduced. Some new Raman frequencies in H_2SeO_3 and H_6TeO_6 are indicated in the paper. C. S. V.

153. VENKATESWARAN, C. S.—The Raman Spectrum of Coumarin. *Current Science*, VI, pp. 328–329, (1938).

An intense Raman spectrum of crystalline coumarin has been reproduced and certain characteristic features discussed. J. N. B.

154. VENKATESWARAN, C. S.—Low Frequency Raman Lines in Organic Crystals. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 448–459, (1938).

The Raman spectra of the low frequency region between 20 and 130 cm.$^{-1}$ have been recorded for 14 organic solids and the influence of rise of temperature up to the melting point on these lines in a few cases has been investigated. These lines in the solids are interpreted as arising partly from translational and partly from rotational oscillations of the molecules with definite phase-relationship with each other in the lattice. Liquid salol exhibits a fairly intense wing near the Rayleigh line which does not appear in salol glass at liquid-air temperature. This observation and other experimental facts such as extension of the wing, the distribution of intensity and the influence of temperature on it and the degree of depolarisation at different points in the wing and the corresponding lines in the solid do not support the hypothesis of Gross and Vuks that most of the wing in liquids arises from the lattice Raman lines and that the liquid state is quasi-crystalline in structure. A band observed in liquids, benzophenone, diphenyl ether and diphenyl in the place of a line above 100 cm.$^{-1}$ in the solids is attributed to a deformational oscillation in the molecule itself, which seems to be characteristic of bicyclic compounds.

C. S. V.

155. **VRKLJAN, V. S.**—Krishnan's Reciprocity Law in Colloid Optics. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 353–355, (1938).

Krishnan's reciprocity relationship $H_v = V_h$ is investigated for the case of oblique observation.

J. N. B.

156. **YOST, D. M.**—Raman Spectra of Volatile Fluorides. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 333–340, (1938).

The author discusses the applications of Raman spectra to chemical problems in connexion with certain simple molecules.

J. N. B.

HEAT.

157. **BASU, S. and MAITRA, A. T.**—Thermal Coefficient of Rocksalt by X-Ray Reflection. *Ind. Journ. Phys.*, XII, pp. 305–316, (1938).

Thermal coefficients of expansion for rocksalt have been investigated by the X-ray reflection method from 30°C. to 450°C. It has been shown that values of the coefficients will vary according as mean, true or zero coefficients are considered.

The expression for calculating the distance between the cleavage planes of rocksalt at different temperatures, up to the range investigated, has been found out to be $2{\cdot}81400\,[1+{\cdot}00004162\,(t-18)]$ in A units.

The effect of temperature on the intensity of reflection from the cleavage face of rocksalt has also been studied for a few temperatures ranging up to 300°C.

S. B.

158. **KOTHARI, D. S.**—Joule-Thomson Effect and Adiabatic Change in Degenerate Gas. *Proc. Nat. Inst. Sci. Ind.*, IV, pp. 69–74, (1938).

An expression for the Joule-Thomson effect in a degenerate gas is derived. A degenerate gas is heated after a Joule-Thomson expansion, the rise in temperature for a given fall in pressure being greater the greater the degree of degeneracy of the gas. The case of adiabatic change is also discussed for comparison. An adiabatic expansion lowers the temperature, but the degree of degeneracy (and also the degree of non-degeneracy in the case of a non-degenerate gas) remains constant during an adiabatic change.

D. S. K.

159. **SIBAIYA, L.**—Critical Temperatures of Liquids. *Current Science*, VI, pp. 329–330, (1938).

A simple relation between the critical temperature of a liquid and the coefficient of cubical expansion is given. Values of the critical temperature of different liquids calculated from this relation agree fairly with experimental values.

J. N. B.

160. **SIRKAR S. C. and GUPTA, J.**—Specific Heat of Carbon Dioxide at Low Temperatures. *Nature*, CXLI, pp. 915–916, (1938).

The new frequency of 58 cm.$^{-1}$ observed by the authors in the Raman spectrum of solid carbon dioxide gives its specific heat values at low temperatures agreeing with observed values when the frequency is taken to be an Einstein frequency and not a Debye frequency.

J. G.

161. Srivastava, B. N.—Joule-Thomson Expansion of a Non-Degenerate Gas. *Proc. Nat. Inst. Sci. Ind.*, IV, pp. 75–82, (1938).

An expression for the Joule-Thomson effect in the case of a non-degenerate gas has been derived. According to this the Joule-Thomson expansion will lead to cooling for a gas obeying Bose-Einstein statistics, while for a gas obeying Fermi-Dirac statistics it will produce heating. The magnitude of this effect varies as $T^{-\frac{3}{2}}$ and is independent of pressure. For the sake of comparison the Joule-Thomson effect has been calculated for helium at certain temperatures on the basis of van der Waals' equation and K. Onnes' experimental equation. It is found that at 5°K the Joule-Thomson effect due to statistical deviation, *i.e.* deviation from the classical perfect gas state due to effect of quantum statistics, amounts to about 10% of that calculated from K. Onnes' experimental equation of state, while at 10°K it is 8%. It is suggested that the Joule-Thomson expansion of helium gas at very low temperatures may afford an experimental test of the statistics obeyed by this gas.

B. N. S.

ACOUSTICS.

162. Dutta, A. K.—Dispersion of Supersonic Waves in Liquids. *Phys. Zeits.*, XXXIX, pp. 186–187, (1938).

The distances between diffraction bands produced in different liquids have been measured on various frequencies. It is inferred from the observed results that the velocity of supersonic waves in water increases by 1·5 in 1000 when the frequency is increased from 3×10^6 to 3×10^7 while that in toluol remains constant within this range of frequencies. It is suggested that this abnormal dispersion in water is due to the complex structure of water and the group formation of its molecules.

J. N. B.

163. Dutta, A. K.—On the Dispersion of Supersonic Waves in a Liquid. *Trans. Bose Res. Inst., Calcutta*, XII, pp. 115–123, (1936-1937).

The author has worked out a formula for the dispersion of supersonic waves in a liquid and has graphically represented the variation of V^2 with $\omega\beta$ where V is the velocity of sound waves, β a constant for a particular substance and ω the angular frequency.

J. N. B.

164. Ghosh, M.—Dynamics of the Pianoforte String and the Hammer. Part I (Hard Hammer). *Ind. Journ. Phys.*, XII, pp. 317–330, (1938).

Dynamics of the damped pianoforte string and the hard hammer has been worked out by the help of well-known operational method. The main idea upon which the dynamics is built up is that the string behaves like a *loaded string* so long as the hammer is in contact with it. Three different cases have been worked out: (1) The hammer strikes very near the end. The expressions for the displacement and the pressure when the string is free from damping are found to be the same as those given by Kaufmann. But this method does not require to assume, like Kaufmann's, that the shorter segment vibrates as a rigid rod during impact which however goes *against* experimental observations. For massive hammer, expressions reduce to those that were obtained independently in a different paper. (2) The general expressions for the displacement and pressure have been also obtained for the string struck at mid-point. Kaufmann tried this with the help of St. Venant's 'variation of integration constant'. But the method fails to include the damping of the string and also fails to give general expressions. (3) The general expressions for the same are also given for the semi-infinite string struck at different points from the finite end. Das also tried this with the help of the method adqpted by Kaufmann but arrived at some algebraical difficulties.

M. G.

165. Ghosh, M.—Dynamics of the Pianoforte String and the Hammer. Part II. *Ind. Journ. Phys.*, XII, pp. 437–454, (1938).

The dynamics of the pianoforte string and the elastic hammer has been worked out following the operational method that was adopted in Part I. The elastic hammer is supposed to behave like *a hard load backed by a weightless spring*, while the string is considered as loaded, so long as the hammer remains in contact with it. Three different cases have been considered, according as the hammer strikes (i) very near the end, (ii) at a finite distance from one end of a semi-infinite string, (iii) at the mid-point. Of the three cases, only the first was considered by Bhargava-Ghosh, and afterwards the second case was considered by Das. Unlike the previous investigations on the subject, the present analysis does not require to *assume Kaufmann's mass-correction.* M. G.

166. GHOSH, M. M.—Note on the Theory of the Elastic Pianoforte Hammer. *Science and Culture*, IV, pp. 252–253, (1938).

A perfectly general expression for the displacement of a pianoforte string has been deduced theoretically without having recourse to Kaufmanns' assumption for the mass correction. J. N. B.

167. GHOSH, R. N.—Theory of the Clarionet. *Journ. Acoust. Soc. America*, IX, pp. 255–264, (1938).

It is pointed out that existing theory cannot account for the partials of a clarionet note. The author presents a new theory of the clarionet and also discusses in detail the vibration of the reed. J. N. B.

168. JATKAR, S. K. K.—Supersonic Velocity in Gases. Part I. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 245–271, (1938).

The possibilities of a quartz oscillator arrangement used to determine the wavelength of supersonic waves have been investigated. The best results are obtained when a somewhat narrow interferometer tube is employed and the quartz is placed a little away from the tube. With this arrangement an accuracy of 1 in 700 is claimed. J. N. B.

169. JATKAR, S. K. K.—Supersonic Velocity in Gases and Vapours. Part II. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 455–465, (1938).

Further evidence regarding the complexity of the wave-form in the Pierce interferometer in vapours has been brought forth by reproduction of the typical records, which show variations of intensity and phase, due to diffraction effects. The anomalous results obtained are thus due to experimental method, rather than to any characteristic of the physical situation, such as complexity of the molecule and its structure, and the attendant absorption and dispersion. As a result of many experiments, only the narrow tube method has been found to be satisfactory for accurate determination of velocity.

S. K. K. J.

170. JATKAR, S. K. K.—Supersonic Velocity in Gases and Vapours. Part III. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 477–487, (1938).

Working with tubes of diameters, 1·25, 1·1, 0·97, 0·95 and 0·64 cm. and with varying apertures, the distances between consecutive positions at which maximum reaction was shown at 49·47 kc./sec. was 0·426, 0·553, 0·708, 0·738 and 1·62 cm. respectively at 25°. The corresponding volumes are 0·522 c.c. for each tube, indicating that points of resonance depend on the integral volumes rather than on the wave-length, with a constant value for the conductivity of the neck. At 48·56 kc./sec. the resonating volumes are integral numbers of 0·535 cm.^{3} showing that the volumes are inversely proportional to the squares of the frequencies, as required by the formula of the Helmholtz resonator. When the neck of the resonator was changed from 0·14 to 0·2 cm. the resonance peaks were inverted, showing that the presence of a tuned resonator increased the intensity of oscillation of the crystal. The average interval (7·07 mm.), observed between two consecutive positions at which the quartz oscillator was brought into oscillation, and that (7·08 mm.) between two major peaks, observed in Part I in an open tube of 0·97 cm. dia. when the oscillations of the crystal (49·47 kc./sec.) were critically controlled, are due to volume resonance. S. K. K. J.

171. **Levi, F.** and **Nath, N. S. N.**—Transmission of Supersonic Waves Through a Rigid Sheet. *Helv. Phys. Acta.*, XI, pp. 408–431, (1938).

The transmission of supersonic waves through a rigid sheet immersed in a liquid has been investigated.

J. N. B.

172. **Mohammad, H. J.**—The Variation of Sound Absorption Coefficient with Intensity. *Proc. Nat. Inst. Sci. Ind.*, IV, pp. 341–364, (1938).

An experimental study of the variation of sound-absorption coefficient α with intensity of sound was made by means of the stationary-wave-method. The materials employed in the investigation were: (1) cotton-waste, (2) treetex, (3) hair-felt, (4) tool (a kind of thin cloth), and (5) an artificial specimen, which was an assemblage of a large number of capillary glass-tubes. It is observed that an increase in the intensity of sound causes an appreciable decrease in the absorption coefficient of these substances. For an increase in sound-intensity from 25 db. to about 55 db., the decrease in α, in the case of cotton-waste and tool, is found to be linear and about 5% and 6% (of itself), respectively. In the case of felted substances (2) and (3), α at first decreases with intensity and after reaching a minimum value begins to increase with further increment in sound-intensity. The maximum decrease in α for (2) and (3) is as much as 15% and 25% (of itself), respectively. In the case of the glass-tube specimen the decrease in α is about 7% for a change of intensity from 25 db. to about 60 db.

In explaining the results, the idea is put forward that an increase in the intensity of sound-waves increases the thickness of the layer of laminar flow or the 'skin' of gas which exists at the surface of the tube when the gas oscillates.

H. J. M.

173. **Nath, N. S. N.**—Diffraction of Light by Supersonic Waves. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 499–503, (1938).

The paper points out an extreme case for which closed expressions for the intensities of the diffraction orders may be derived. The theory given here is valid for any frequency so long as the supersonic field is not so strong as to excite the second and other higher orders.

J. N. B.

174. **Nath, N. S. N.**—Diffraction of Light by Supersonic Waves in Solids. *Proc. Camb. Phil. Soc.*, XXXIV, pp. 213–223, (1938).

The author has investigated theoretically the case of optical diffraction due to two sound waves passing in the same direction through a block of glass. The deductions are in agreement with the experimental results of Hiedemann and Hoesch and also indicate the existence of combination orders.

J. N. B.

175. **Nath, N. S. Nagendra** and **Mueller, H.**—Diffraction of Light by Supersonic Waves. *Nature*, CXLI, p. 37, (1938).

The authors put forward theoretical considerations as an attempt to explain a curious diffraction effect observed by Hiedemann and Hoesch.

J. N. B.

176. **Parthasarathy, S.**—Sound Velocity and Chemical Constitution. *Current Science*, VI, pp. 322–323, (1938).

The author presents a brief review of the results of experiments carried out to determine the velocity of supersonic waves in organic liquids and to study the effect of the chemical constitution of the liquid on this velocity.

J. N. B.

177. **Parthasarathy, S.**—Absorption of Ultrasonic Waves by Organic Liquids. *Current Science*, VI, pp. 501-502, (1938).

The note contains results of the measurement of absorption coefficient of ultrasonic waves in different organic liquids. It has been pointed out that the liquids for which the absorption is very high have also a high value of γ, the ratio of the specific heats.

J. N. B.

178. **Rao, B. V. R.**—Dispersion of Acoustic Velocity in Liquids. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 163–175, (1938).

The present paper deals with the acoustic velocity determinations of 'hypersonic' waves ($>10^9\sim$) by a study of the fine structure of the radiations scattered by liquids under suitably controlled experimental conditions like the use of a specially designed, low density, kathode-cooled, Hg vapour lamp and a proper selection of the invar distance piece of the etalon employed with reference to the sound velocity in the particular liquid under examination and the radiation employed. The results indicate the presence of dispersion of acoustic velocity in liquids with frequency in the case of two typical liquids like CCl_4 and acetone which have stood the test of careful repetition and scrutiny. These results are discussed at some length and their bearing on the hitherto unexplained anomalous acoustic damping in liquids in the 'ultra-sonic' ($<10^9\sim$) region is indicated.

B. V. R. R.

179. **Rao, K. N.**—Theory of Indian Musical Drums. Part I. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 75–84, (1938).

The paper contains a discussion of the normal modes of vibration of a symmetrically loaded membrane in which the surface density varies as an inverse fractional power of the radial distance from the centre, with a view to finding how far the harmonic sequence of tones observed in the Indian musical drum approximates to a law of density of this type. It is shown that for a law of density varying in inverse proportion to the radius, the first four modes with nodal diameters only, form an approximate harmonic sequence with the fundamental. With this law of loading, however, the relative frequencies of the symmetrical modes remain entirely unaffected (though their interior nodal circles contract), while the frequencies of the modes having both nodal diameters and nodal circles require a greater degree of loading than that stated above to fall into the same harmonic sequence. The results thus show clearly that a type of loading so highly concentrated at the centre cannot succeed in reproducing completely the observed results. The indications are that a more widely distributed load such as is actually employed should theoretically be necessary to achieve the desired purpose.

K. N. R.

180. **Rao, K. N.**—Diffraction of Light by Supersonic Waves. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 124–134, (1938).

The results of Raman and Nath in their general theory of the diffraction of light by supersonic waves at normal and oblique incidences are shown to be in complete agreement with those of van Cittert for the case of normal incidence and also with those obtained by extending van Cittert's method to the case of oblique incidence. The amplitude function for the latter case is developed *in extenso* in a series of Bessel functions. The expression for the intensity with normal incidence in the case of N systems of sound waves is $| J_{n_1}(\sigma_1 z)\, J_{n_2}(\sigma_2 z) \ldots J_{n_N}(\sigma_N z)|^2$, where n_1, n_2, . . . n_N are the orders excited. This result is the same as that which has been obtained by E. Fues by applying the simplified Raman-Nath method to the case considered.

K. N. R.

181. **Rau, M. A. G.**—Diffraction of Light by Superposed Supersonic Waves. *Proc. Ind. Acad. Sci.*, VIII, Sec. A, pp. 6-7, (1938).

Pictures are reproduced of the diffraction patterns obtained with light that has traversed a system of superposed supersonic waves set up in a liquid. Besides the presence of combination lines, the pictures clearly show the characteristic manner in which their number and intensities depend upon the intensity of the original spectral orders.

M. A. G. R.

182. **Sibaiya, L.**—On the Excitation of Chladni Figures. *Ind. Journ. Phys.*, XII, pp. 407–408, (1938).

A simple method of obtaining Chladni figures on plates is discussed. A type of musical drone used by certain beggars in South India is also described.

J. N. B.

Electricity and Magnetism.

183. **Abichandani, C. T.** and **Jatkar, S. K. K.**—Metal-Metal Oxide Electrodes. Part I. W and Mo Electrodes. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 345–361, (1938).

The behaviour of polished W and Mo wire electrodes has been studied over a *p*H range 2–12 in an atmosphere of H_2. It has been shown that a W electrode gives a theoretical relationship of *p*H and e.m.f. over a range of *p*H 2·8 to 9·4, and a Mo electrode over a short range from *p*H 5 to 7. Experiments have also been made in atmosphere of air and O_2, when the electrodes deviated very much from the theoretical relationship. Temperature coefficient of the system Pt; H_2 solution *p*H‖WxOy|W has been measured and the values for free energy and heat of formation of various oxides calculated. The calculated data agree well with the heat of formation of tungsten trioxide on the surface of the metal.

C. T. A.

184. **Abichandani, C. T.** and **Jatkar, S. K. K.**—Differential Titrations with Tungsten Electrodes. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 363–367, (1938).

An arrangement with tungsten electrodes and a thermionic valve is described and curves obtained therefrom for a number of acids are given.

J. N. B.

185. **Abichandani, C. T.** and **Jatkar, S. K. K.**—Automatic Potentiometric Titration Apparatus. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 369–371, (1938).

The method is described with illustrations of the apparatus.

J. N. B.

186. **Aravamuthachari, S.**—The Magnetic Susceptibility of Dilute Sodium Amalgams. *Current Science*, VII, pp. 179–180, (1938).

The magnetic susceptibility of dilute sodium amalgams has been studied by the Curie method and the results are presented in this note.

J. N. B.

187. **Bajpai, R. R.** and **Pant, B. D.**—A Study of the F-Region of the Ionosphere. *Ind. Journ. Phys*, XII, pp. 211–222, (1938).

The results of ionisation measurements in the F-region during Oct., Nov. and Dec., 1936 are reported. A number of typical curves showing the diurnal variation of electron density are given and their salient features discussed.

Separate existence of the F_1-region has been observed till a few hours after sunset.

Evidence is summarised to show that the solar theory of upper atmospheric ionisation is inadequate to explain all the observed phenomena. Either the theory should be modified or some other source or mechanism of electron production should be found out.

R. R. B.

188. **Banerjee, A. K.**—Electrical Constants of Ionised Air for Micro-Waves. *Science and Culture*, IV, pp. 359–360, (1938).

The author has measured the dielectric constant and conductivity of ionised air according to a method suggested by McPetrie. The difficulty of producing more than two antinodes along the Lecher wires was obviated by employing micro-waves of wavelength from 22 cm. to 45 cm.

J. N. B.

189. BANERJI, S. K.—On the Interchange of Electricity between Solids, Liquids and Gases in Mechanical Actions. *Ind. Journ. Phys.*, XII, pp. 409–436, (1938).

When liquids or solid particles are subjected to various mechanical processes, such as frictional force, spraying, splashing, raining or blowing, striking against each other, etc., electric charges are developed in the substance, in the apparatus used in the mechanical process and in the surrounding medium. Similarly, some gas jets produce positive charge and others negative charge on the nozzle or on the plate on which they impinge. We have no complete picture for any one case to show how the interchange of electricity takes place between the apparatus, substance and the medium; consequently, experiments were undertaken with a number of substances, initially uncharged and initially charged, to supplement the observations made by previous workers. These show, as one should expect, that—

(1) The total charge in the substance, in the apparatus (or escaping into earth through the apparatus) and the medium in any mechanical process is zero. While the total remains zero, the distribution between the apparatus, substance and the medium (positive and negative ions) show wide variations according to the process employed and the substance used. If the operation produces in any case an equal number of positive and negative ions in the medium, the substance and the apparatus either collectively or separately remain uncharged.

(2) The charge developed depends on the violence of the mechanical action. Only a part of the work done in such processes is converted into electricity.

If the existence of an electrical double-layer between the substance and the medium is assumed, the ions in the medium come from both layers of the double-layer, but generally move from the layer situated on the molecules of the medium. The more violent is the process the greater is the number of ions dislodged from the layer situated on the molecules of the substance.

If a substance has an initial charge, this charge does not play any part in the interchange of electricity between it and the medium. The initial charge adheres to the substance during the process of disruption.

The exchange of electricity between substance and medium in all mechanical actions can be explained on the assumption of an electrical double-layer.

When increasing quantities of NaCl or HCl are dissolved in distilled water, the charge in the substance changes very sharply from positive to negative at a very low concentration. The distribution in such cases of charge in the substance, in the apparatus, and in the air in the shape of positive and negative ions is discussed particularly at the stage when the transition from positive to negative takes place. When the substance passes through the transition point, a reversal of the double layer takes place.

S. K. B.

190. BANERJEE, S. S. and JOSHI, R. D.—Dielectric Constant and Conductivity of Soil at High Radio Frequencies. *Phil. Mag.*, XXV, pp. 1025–1033, (1938).

Conductivity and the dielectric constant of soil at ultra-high frequencies have been determined experimentally by measuring the actual attenuation of the waves in the soil . . . . The conductivity increases with the frequency as well as the moisture content. For dry soil or soil of less moisture content the conductivity increased from a value of $1{\cdot}5 \times 10^6$ e.s.u. to a value nearly equal to $2{\cdot}6 \times 10^6$ e.s.u. Unlike the conductivity the dielectric constant diminishes with a rise of frequency, but it increases with moisture content. It varied from a value of nearly 4·5 at a moisture content of 6·3% to a value of 17·3 at a moisture content of 13·9% . . . . The values of conductivity and dielectric constant obtained are small for Indian soil as compared with the values previously found in other countries.

S. S. B.

191. **Banerjee, S. S.** and **Singh, B. N.**—Effect of Longitudinal Magnetic Field on the Refractive Index and Conductivity of Ionised Air. *Nature*, CXLI, pp. 511-512, (1938).

The variation of refractive index and conductivity of ionised air under the influence of a longitudinal magnetic field has been experimentally studied and compared with the variation calculated from theoretical formulae.
J. N. B.

192. **Bhar, J. N.**—Stratification of the Ionosphere. *Ind. Journ. Phys.* XII, pp. 363-386, (1938).

Calculations of upper atmospheric ionisation are made after Pannekoek with certain modifications. It is assumed that the upper atmosphere above 100 km. consists mainly of N_2 and O while the lower and the middle atmosphere below this level consists of N_2 and O_2. There is a layer of transition between the two occupying the region 80–130 km. The temperature in the upper atmosphere is assumed to be 600°K and that in the transition layer 300°K. The sun is taken to be radiating like a black body at 6800°K. Calculations show that there are ionisation maxima at 250 km. due to O, at 160 km. due to N_2 and 90 km. due to O_2. These three maxima are identified with the F_2, F_1 and E_1 regions.

The most interesting point to be noted is that attempts at obtaining from theoretical considerations a layer of ionisation at the height of the E_1-region have hitherto failed. This, in fact, prompted Chapman to put forward the hypothesis that the ionisation of the F-region was due to ultra-violet radiation while that of the E-region was due to the bombardment of neutral corpuscles shot off from the sun. It is well-known that observations during solar eclipses prove definitely that the E_1-region ionisation is also due to solar ultra-violet radiation. The work described here thus removes the anomaly regarding the formation of the E_1 layer. It can now be definitely asserted that the region round 100 km. in which rapid transition of O_2 to O occurs is also, as a consequence, the region of maximum ionisation of O_2 and that the ionised layer formed near this level is to be identified with the E_1 layer.
J. N. B.

193. **Bhatnagar, S. S.**—Recent Advances in Magneto-Chemistry. *Science and Culture*, III, pp. 466–475, (1938).

A review of the development of our knowledge of the subject.
J. N. B.

194. **Bhatnagar, S. S.**, **Kapur, P. L.** and **Mittal, G. L.**—Magnetic Properties of Copper Amalgams. *Current Science*, VII, pp. 279-280, (1938).

The note presents results of measurements of the magnetic susceptibilities of copper amalgams prepared under definite conditions with the help of Gouy's balance.
J. N. B.

195. **Bhatnagar, S. S.**, **Khanna, M. M.** and **Neogi, M. B.**—Paramagnetism of the Iron Group. *Phil. Mag.*, XXV, pp. 234–241, (1938).

The p_β values of pure anhydrous salts of Co and Ni are experimentally determined and compared with data obtained by previous workers, both theoretically and experimentally.
J. N. B.

196. **Bhatnagar, S. S.**, **Prakash, B.** and **Hamid, A.**—Magnetism and Molecular Constitution of Chromium Compounds. *Jour. Chem. Soc.*, pp. 1428–1434, (1938).

In the present work an attempt is made to define the structure of some Cr compounds from the magnetic standpoint. The susceptibilities of Cr ions in different valency states were calculated from the van Vleck, Sommerfeld, Bose, and Stoner formula $\chi_M = N\beta^2 [4s\ (s+1)]/3\ kT.$, and compared with the experimental values determined on a modified form of Gouy's balance.
S. S. B.

197 BHIDE, B. V. and BHIDE, R. V.—Dielectric Constants of Glycerides. *Current Science*, VII, p. 16, (1938).

The dielectric constants of monomyristin and benzophenone have been measured at radio frequencies and the results reported.

J. N. B.

198. BOSE, J. K. and KHASTGIR, S. R.—Unipolar Conductivity of Carborundum. *Zeits. f. Physik*, CIX, pp. 80–84, (1938).

The rectifying action of a carborundum crystal clamped between two similar metallic point electrodes falls off continuously with increase in the applied A.C. voltage. It is suggested that the rectifying action is due to unipolar volume conductivity rather than to surface effects.

J. N. B.

199. BOSE, S. N.—On the Total Reflection of Electromagnetic Waves in the Ionosphere. *Ind. Journ. Phys.*, XII, pp. 121–144, (1938).

The method of characteristics has been applied to the microscopic equations of Lorentz for studying the wave propagation through the ionosphere. Representing a wave disturbance by $A_0 + Ae^s$ where s is an unrestricted function—real or complex—of x, y, z and t, the electromagnetic equations are developed and then discussed in terms of the electric and magnetic vectors E, H, grad s, θ_0 and θ where θ is the amplitude of the variable part of the convection current θe^s and θ_0—the fluctuating part of the electric charge density due to the disturbance. The refractive index is then defined as $\mu = \dfrac{\text{grad } s}{\frac{1}{c}\frac{\partial s}{\partial t}}$ and it is shown that total reflection will take place when $\frac{H^2}{E^2} = 0$ or when grad s $(E \times H) = 0$. In the particular case when $E \parallel \theta$, the above condition is equivalent to the one $\mu^2 = 0$ assumed by Appleton and in the general case, the condition refers to that of vanishing group velocity. These results are then applied to the case of wave reflection in the ionosphere and it is shown that when the damping due to collision is neglected, the equations for critical frequencies agree with those obtained by Appleton and others. When however damping is included, equations of critical frequencies can be deduced in some special cases only and are found to include a term containing the collisional frequency. In the general case, the critical frequencies are found to be defined by an equation of the fourth degree. Although the case of wave propagation through the ionosphere is discussed, the method can be applied for discussion of propagation of light in a material medium.

S. P. G.

200. CHAKRAVARTY, M. K. and KHASTGIR, S. R.—Direct Determination of the Electrical Constants of Soil at Ultra High Radio Frequency. *Phil. Mag.*, XXV, pp. 793–801, (1938).

The attenuation of ultra-short waves travelling along a Lecher-wire system immersed in a specimen of Dacca soil was determined for a certain range of ultra-high frequencies (73 to 89 Mc./sec.) and for varying moisture-contents from 8 to 41%. The values of the electrical conductivity σ and the dielectric constant ϵ of the soil were then determined by the application of the standard formulae. The value of the dielectric constant of the specimen of the soil varied from 3·95 e.s.u. at a moisture-content of 8% to 29·4 e.s.u. at a moisture-content of 41%. The value of the electrical conductivity was of the order of 10^{-14} e.m.u. It increased with moisture-content. The electrical conductivity of the soil was found first to increase and then to diminish with the increase of frequency. The dielectric constant of the soil was found to diminish with the rise of frequency, as is expected from Debye's theory of h.f. dispersion in polar liquids. It is to be noted that the values of the electrical conductivity and the dielectric constant of the soil obtained by the direct laboratory method agree well with the values estimated from the attenuation measurements.

M. K. C.

201. DUBE, G. P.—Resistance of a Metal at Low Temperatures and Matthiessen's Rule. *Proc. Camb. Phil. Soc.*, XXXIV, pp. 559–567, (1938).

By solving the fundamental integral equation an expression is obtained for the electrical resistance which takes into account, to the first approximation, the mutual influence of the impurities and the lattice vibrations. It is found that deviations from Matthiessen's rule are to be expected and that these deviations are surprisingly large. The formulae derived only indicate the trend of the resistance curve, but this trend is not confirmed by experiment. Whereas the theory indicates that the mutual influence of the impurities and the lattice vibrations should decrease the electrical resistance, the experimental results of Gruneisen on copper show that, when deviations from Matthiessen's rule occur, the resistance is increased.

G. P. D.

202. GANGOPADHYAYA, S. and KHASTGIR, S. R.—Dielectric Constant of Ionised Gases. *Phil. Mag.*, XXV, pp. 883–895, (1938).

The authors describe experiments carried out with a view to investigate the cause of the anomalous variation of the dielectric constant of an ionised gas. The observed increase of the value of dielectric constant beyond unity is explained as due to ionic sheath formation on the inner surface of the discharge tube. When this ionic sheath was eliminated it was found that the dielectric constant of ionised air never exceeded unity. Other experimental results are also discussed.

J. N. B.

203. GHOSH, K. P. and GHOSH, B. B.—On the Electric Conduction due to $4f$-electrons in some Trivalent Rare Earth Compounds. *Ind. Journ. Phys.*, XII, pp. 259–270, (1938).

The conductivity of fluorides of La, Ce, Pr, and Nd in the form of fine crystals has been measured by compressing them to the form of solid rings placed between two co-axial cylindrical electrodes. Taking lanthanum fluoride as standard and subtracting the conductivity of lanthanum fluoride from those of other fluorides, the contribution to conductivity due to $4f$-electrons has been determined. Using a formula similar to that of Wilson for semi-conductors, it is found that ΔW calculated from the measurements agrees approximately with the over-all width of the multiplet structure of the free ions of these elements as obtained from magnetic and spectroscopic data.

K. P. G.

204. GHOSH, S. P.—Measurement of the True Height of the F-Layer. *Science and Culture*, III, p. 497, (1938).

The true height (as opposed to the equivalent height) of the F-layer has been calculated after the method of Murray and Hoag from the P'-f curves obtained by the author.

J. N. B.

205. GHOSH, S. P.—Dispersion, Absorption and Polarisation Curves for Radio Wave Propagation in the Ionosphere. *Ind. Journ. Phys.*, XII, pp. 341–354, (1938).

Dispersion, absorption and polarisation curves for radio wave propagation in the ionosphere for frequencies 3·0, 1·27, 0·6 megacycles and for collisional frequencies 0·0, 10^6, $5{\cdot}4 \times 10^6$, 10^7 are drawn on the basis of the magneto-ionic formulae of Appleton and Hartree for the magnetic condition of the upper atmosphere at Calcutta (total intensity 0·452 gauss, dip 31°45′N). In connection with the state of polarisation of the down-coming waves the case of limiting polarisation is discussed. It is shown that contrary to the view held by some authors, the polarisation of the two split components on their emergence from the ionosphere will, in general, be elliptical. This latter view confirms the experimentally obtained results regarding the nature of limiting polarisation.

S. P. G.

206. Imam, A., Gangopadhyaya, S. and Khastgir, S. R.—A Method of Measuring R.F. Current and its Application to the Absolute Measurement of Field Strength of Weak Radio Signals. *Ind. Journ. Phys.*, XI, pp. 361–376, (1938).

Martyn's method has been adopted in a modified form to measure radio-frequency alternating currents of the order of 10^{-6} ampere. The method has been applied to the absolute determinations of the field-strengths of weak signals. The details of the method and of its application are given in the paper.

The day value at Dacca of the field-strength of the V.U.C. station (Calcutta) has been determined. From a knowledge of the metre-amperage of the station, the Austin-Cohen coefficient has been calculated.

The field-strengths of the night signals from the same station and also from the V.U.D. (Delhi) station have also been determined.

A. I.

207. Joshi, R. D.—Effect of Temperature on the Electrical Constants of Soil at Radio Frequencies. *Ind. Journ. Phys.*, XII, pp. 1–8, (1938).

Variation of dielectric constant and conductivity of soil with temperature from 0°C. to 105°C. at high radio frequencies have been determined by the substitution method by measuring the capacitance and resistance of a condenser with dry soil as dielectric. The conductivity was found to be of the order of $3{\cdot}4 \times 10^5$ e.s.u. at 0°C. and $8{\cdot}2 \times 10^5$ at 105°C. The value of the dielectric constant was found to be about 4·0 and it remained fairly constant with rise of temperature. The temperature coefficient of conductivity is found to be positive and the value is 2·0 per cent per degree centigrade at 20°C. and it increases with the frequency. It has been concluded from these observations and also from some previous results that the value of conductivity of soil will be higher in the summer and the rainy season than in winter.

R. D. J.

208. Joshi, R. D.—Theoretical Interpretation of the Variation of Electrical Constants of Soil with Moisture Content, Temperature and Frequency. *Science and Culture*, IV, pp. 196-197, (1938).

In this note the variation of the dielectric constant and conductivity of soil with moisture content, temperature and also frequency has been explained by applying the theory of Wagner which is a modification of Maxwell's theory.

J. N. B.

209. Joshi, R. D.—Weather Conditions and Radio Reception at Long Distances. *Science and Culture*, IV, p. 250, (1938).

The variation of signal intensity of the Delhi station working on 340 metres as received at Benares has been studied in relation to different meteorological conditions.

J. N. B.

210. Joshi, R. D.—Variation of the Amplification Factor of Thermionic Valves in a Magnetic Field. *Science and Culture*, IV, p. 302, (1938).

The effect of a homogeneous magnetic field on the performance of a thermionic valve has been investigated.

J. N. B.

211. Joshi, R. D. and Saxena, R. G.—Variations of the Amplification Factor and Plate Resistance of Thermionic Valves at High Frequencies. *Science and Culture*, III, pp. 569-570, (1938).

The note contains the results of investigations on the variation of amplification factor and plate resistance of a thermionic valve at different frequencies ranging from 120 kc./sec. to 5,000 kc./sec.

J. N. B.

212. **Khastgir, S. R.** and **Chakravarty, M. K.**—The Attenuation of Ultra-short Radio Waves along the Earth. *Ind. Journ. Phys.*, XII, pp. 289–298, (1938).

Relative field-strength was measured at different distances along a straight line over level earth from a portable ultra-short wave transmitter fitted with a quarter wave aerial. The transmitter was of sufficient power to enable field-strength measurements to be carried out with accuracy up to a distance of 50 m. from the transmitter. A wave-length of 3·64 m. was employed for the purpose. The receiver used was a heterodyne receiver with an oscillator-detector circuit followed by L.F. power amplification. The L.F. alternating voltage developed across the telephones in the output circuit, when the transmitter was on, was measured by a sensitive valve-voltmeter constructed for the purpose. Before any attenuation measurement was made, the frequency of the beat-note was adjusted whenever necessary, and brought in tune with the fixed note of a Galton whistle. All readings were taken through telescopes situated at some distance.

The attenuation measurements have been examined in the light of Norton's formula for ground attenuation of radio waves from a short dipole antenna. The values of the electrical conductivity σ and dielectric constant ϵ of the ground which give agreement with Norton's formula are :—

$$\epsilon = 7 \text{ e.s.u.}, \quad \sigma = 0{\cdot}91 \times 10^{-14} \text{ e.m.u.}$$

The values for moist ground have been however larger, *viz.*,

$$\epsilon = 10 \text{ e.s.u.}, \quad \sigma = 1{\cdot}82 \times 10^{-14} \text{ e.m.u.}$$

It is significant that these values agreed in their orders of magnitude with the values obtained by the direct laboratory method.

S. R. K.

213. **Krishnan, R.** and **Jatkar, S. K. K.**—Dissociation of O_2 and Formation of O_3 in the Silent Electric Discharge. *Journ. Ind. Inst. Sci.*, XXI, Sec. A, pp. 223–236, (1938).

The authors have investigated the reaction in the Siemens ozoniser under static conditions and the equilibrium has been studied from the standpoint of the application of the law of mass action. Equilibrium was attained from one side only, using different initial pressures and different exciting voltages. At higher pressures there was a gradual approach to equilibrium when the exciting voltage was low. At lower pressures, there was a rise in pressure apparently due to the dissociation of O_2 into O atoms. When the exciting potentials were increased the equilibrium was reached in a shorter time and the dissociation of O_2 was observed at a higher pressure of O_2 than in experiments at a low exciting voltage. The O_3 produced is never proportional to ionisation as the quantity of O_3 formed is not at all related to the current flowing. Instead of assuming that a large number of secondary ions are produced by shock excitation and that these ions do not reach the electrode even under saturating conditions, it is much simpler to assume that dissociation of O_2 occurs under the effect of silent electric discharge and that the atomic O combines with the excited O_2 molecule to form O_3. The equilibrium constant is calculated for the two reactions $O_2^* \rightleftharpoons 2O$ and $O_2^* + O \rightleftharpoons O_3$, which occur simultaneously. The constants are fairly concordant and well within the experimental error.

R. K.

214. **Majumdar, B.**—The Theory of Absorption in Ionised Gas. I. Opacity in Stellar Material. II. Optical Properties of Liquid Metals. *Ind. Journ. Phys.*, XII, pp. 233–248, (1938).

In § 1 a quantum theory of absorption of electromagnetic radiation by ionised gas is worked out, in which the electrons take up energy from the electric field of the incident radiation and transform it by collisions with ions to random motion of electrons and ions. In § 2 the theory is applied to calculate the opacity coefficients in stellar interior and the results are compared with those obtained by Eddington from Kramers' process of absorption for a free-free transition. In § 3 the optical properties of liquid metals are studied from this general theory and found to agree fairly well with the observations.

B. M.

215. **Majumdar, R. C.**—The Theory of Molecular Dissociation and the Fundamental Mechanism in the Upper Atmosphere. *Ind. Journ. Phys.*, XII, pp. 75–86, (1938).

In the first article a theoretical formula is developed to estimate the degree of molecular dissociation in the upper atmosphere under the action of the ultra-violet light of the sun. In the second article the dissociation of oxygen and nitrogen molecules is discussed and it is found that the oxygen molecules are completely dissociated at a height of about 167 km., *i.e.*, much above the E-region of the ionosphere, provided we assume a temperature of 300°K and a molecular weight corresponding to the average mass of nitrogen molecules. In the last article the constituents as well as the mechanism of the fundamental processes in the ionosphere are discussed.

R. C. M.

216. **Majumdar, R. C.**—On the Reflection of Electromagnetic Waves in the Ionosphere. *Trans. Bose Res. Inst., Calcutta*, XII, pp. 125–140, (1936–1937).

The conditions for the total reflection of electromagnetic waves in the ionosphere are examined directly from the definition that the total reflection takes place when the flow of energy associated with the wave vanishes across the wave front. It is found that the electromagnetic waves are totally reflected from a layer where either the refractive index vanishes or it becomes infinitely large. The critical penetration frequencies are worked out in general when the damping of the wave is not neglected. The Sellmeyer vs. Lorentz theory is also discussed in this connection.

R. C. M.

217. **Mandlekar, M. R.** and **Banerjea, H. N.**—Base Metal Thermocouples. Their Characteristics. *Current Science*, VI, pp. 447-448, (1938).

The thermo-e.m.f. relations of some of the common base metal thermocouples have been studied and their characteristics reported briefly.

J. N. B.

218. **Mitra, S. K.**—The Ozonosphere and the Early Morning Increase of E-Layer Ionisation of the Ionosphere. *Science and Culture*, III, pp. 496-497, (1938).

It has been observed that the increase of ionisation in the E-region begins to occur when the sun's rays fall on the layer grazing the top of the ozonosphere and not grazing the surface of the earth. The importance of this observation is discussed.

J. N. B.

219. **Mitra, S. K.**—Origin of the E-Layer of the Ionosphere. *Nature*, CXLII, pp. 914-915, (1938).

The origin of the E-layer is attributed to the photo-ionisation of O_2 in the region of transition of O_2 to O which lies between 80 km. and 130 km.

J. N. B.

220. **Mitra, S. K.**, **Bhar, J. N.** and **Ghosh, S. P.**—The Lower Ionosphere. *Ind. Journ. Phys.*, XII, pp. 455–465, (1938).

It is now recognised that layers of ionisation maxima capable of reflecting radio waves, not unlike those existing in the upper ionosphere, are also formed in the middle and the lower atmosphere. The mode of reflection of radio waves in these dense regions of the atmosphere must be different from that in the upper E and F ionospheric regions where the collisional frequency is small compared with the exploring wave frequency and the refractive index has a value less than unity. In order to investigate the mode of reflection from these lower ionised regions, curves have been drawn depicting the variations of μ (refractive index) and κ (absorption coefficient) with N (electron density) for various values of ν (collisional frequency) appropriate for the dense middle atmospheric regions. It is found that near certain values of N depending on the value of the collisional frequency, μ increases rapidly with increasing N. If for an ionised layer in the middle or the lower atmosphere N has a value corresponding to any of these, then near its lower boundary N will increase with height and may produce large variation of μ within distances small compared with the exploring wave-length (measured in vacuum). Such regions of rapidly varying μ will be able to cause reflection of radio waves. Probable reflection coefficients of such regions are calculated with the help of the dispersion and the absorption curves using the expression of reflection coefficient for metallic surfaces. Cases considered are $\nu = 10^8$, 10^9 and 10^{10} per second for wave frequency 4 Mc./sec. Calculations show that for the above values of ν, the corresponding values of N near which μ rapidly changes are $10^{6 \cdot 5}$, $10^{7 \cdot 5}$ and $10^{8 \cdot 5}$ per c.c.

Possible modes of formation of the ionised regions are also considered by applying Pannekoek's method to the case of the first ionisation potentials of O_2 (12·2 e.v.) and N_2 (15·5 e.v.). It is found that the height of the ionisation maximum for N_2 agrees with the height of the E_2-layer (140 km.). Similar calculation for O_2 yields an ionisation maximum the height of which corresponds to the D-layer (55 km.). Lack of knowledge of the ionisation potentials of O_3 prevents calculation for the ionisation maximum which may possibly be produced at lower heights corresponding to the C_2-layer (30 km.).

S. K. M.

221. MUKHERJEE, H.—Determination of the Frequency of an Oscillator with a Condenser. *Ind. Journ Phys.*, XII, pp. 195–202. (1938).

With an a.c. galvanometer of the form of a watt-meter or a dynamometer null point is obtained under two conditions, namely, (1) when the current through either the fixed or the moving coil is zero, and (2) when the phase difference between the currents in the two systems of coils is 90°. In the method described below, advantage is taken of the second condition. The resistances and the condenser are arranged in the arms of a Wheatstone net, the moving coil in one of the diagonal arms and the fixed coils in series with the current source in the other diagonal arm. It is shown that the phase-difference between the currents in the two systems of coils is 90° when

$$\frac{1}{C^2p^2} = \frac{Q}{P}R\left\{R+\frac{G(P+Q)}{P+Q+G}\right\}.$$

H. M.

222. MUKHOPADHYAYA, B.—On the Resistivity of Thin Films of Metals. *Science and Culture,* III, pp. 626-627, (1938).

An expression for the electrical resistivity of thin films has been obtained. Values of the resistivity calculated from this expression for the case of Re have been compared with Lovell's experimental values for different thicknesses. [See following Abstract.]

J. N. B.

223. MUKHOPADHYAYA, B.—Resistivity of Thin Films—Caesium. *Science and Culture,* IV, pp. 131-132, (1938).

Values of electrical resistivity calculated from the author's formula for different thicknesses of Cs films have been compared with the values obtained by Lovell and Appleyard. Satisfactory agreement has been observed except for thicknesses from 20 to 100Å.

J. N. B.

224. NILAKANTAN, P.—Magnetic Anisotropy of Naturally Occurring Substances. Part III. Wood and Its Constituents. *Proc. Ind. Acad. Sci.*, VII, Sec. A, pp. 38–49, (1938).

The diamagnetic anisotropy and absolute susceptibilities of wood, lignin and wood cellulose have been determined. It has been found that the 'crystalline' element in wood is definitely cellulose and that lignin and the hemi-celluloses make no contribution to the magnetic anisotropy, suggesting either a random orientation if they are crystalline or an amorphous structure. In the light of evidence from other sources, it seems most likely that they are amorphous. The anisotropy measurements also indicate that the direction of maximum diamagnetic susceptibility in the cellulose molecule is along the length of the chain. Since it is also known that the direction of maximum electric polarisability too is along the chain length, the author finds that these directions coincide in the molecule just as in the case of the higher long-chain saturated hydrocarbons.

P. N.

225. **Paranjpe, G. R.** and **Davar, D. J.**—Dielectric Properties of Some Organic Substances. *Ind. Journ. Phys.*, XII, pp. 283–288, (1938).

The density, the refractive index and the dielectric constant are determined at room temperature (30°C.) for the solutions of oleic acid, linolic acid, triolein, triricinolein, and tristearin in benzene. The dielectric constant is determined at 7,500 Kc. (40 meters) using the method of resonance and a valve-voltmeter. The refractive index is determined for Na lines. The polarizations and the electric moment of the substances are calculated from the Debye equation using the method of least squares. The electric moment is explained from the point of view of the chemical constitution and structure of the substances. The values obtained are: oleic acid 1·009, linolic acid 1·208; triolein 3·158, triricinolein 4·117 and tristearin 2·844.

G. R. P.

226. **Rao, B. S. M.**—Ring Structure of the Electron. *Phys. Zeits.*, XXXIX, pp. 187–189, (1938).

It is shown that Stark's hypothesis that a spinning electron can be replaced by an electron with ring structure leads to contradictions with experiment.

J. N. B.

227. **Rao, S. R.** and **Narayanaswami, A. S.**—Crystalline Diamagnetism of Thallium. *Phil. Mag.*, XXVI, pp. 1018–1030, (1938).

A study is made of the principal diamagnetic susceptibilities of Tl containing small admixtures of Cd, Pb, Sn and Bi. While Cd increases the magnetic anisotropy of Tl, the other metals decrease this value. Although Pb and Sn contain the same number of valence electrons, Sn is 2·5 times as effective as Pb in reducing the magnetic anisotropy. Attention is drawn to the similarity of these observations with those on Bi by Goetz and Focke and by Shoenberg and Uddin. Cold-working of Tl is accompanied by a reduction of its magnetic anisotropy.

S. R. R.

228. **Rao, S. R.** and **Sriraman, S.**—Diamagnetism of Cadmium. *Proc. Roy. Soc.*, CLXVI, Ser. A, pp. 325–341, (1938).

Single crystals of Cd were prepared by the method of slow cooling and the principal magnetic susceptibilities were determined by the Gouy method. The influence of ferromagnetic impurities on the observed values was eliminated by determining the susceptibilities at different field strengths in accordance with Honda's method. The mean values perpendicular and parallel to the hexagonal axis of the crystal were found to be $-0{\cdot}163$ and $-0{\cdot}223$ respectively. The magnetic anisotropy was 1·368 and the mean diamagnetic susceptibility for a polycrystalline aggregate $-0{\cdot}183$. The value $-0{\cdot}163$ of $\chi_{\perp}$ is close to that of McLennan, Ruedy and Cohen but the author's value of $\chi_{\parallel}$ is lower than theirs. This makes the magnetic anisotropy of Cd much nearer that of Zn than the earlier values indicated. The influence of cold-working on polycrystalline rods and single crystals of Cd was investigated. In the case of polycrystalline specimens, a small decrease was obtained. On the other hand, the principal susceptibilities measured with single crystals showed no variation on cold-working. The influence of small quantities of foreign matter was also a subject of investigation. Pb when added in small amounts affected the principal susceptibility normal to the c-axis but not the value parallel to this axis. The principal susceptibilities did not alter as a result of adding small quantities of Zn. These results are examined in the light of the theory of paramagnetism of free electrons developed by Pauli, Landau and Peierls. The valency electrons appear to contribute a paramagnetic component perpendicular to the c-axis. There is evidence for this from electrical conductivity data. The results obtained with the alloys are examined in the light of these conclusions.

S. R. R.

229. **Ray, B. B.**—Absorption of Radio Waves in the Ionosphere. *Science and Culture*, III, pp. 679–682, (1938).

The author asserts that in the E-region the absorption of radio waves is due to the collision between electrons and neutral molecules in contradiction to Majumdar's hypothesis that collision between electrons and positive ions is mainly operative. J. N. B.

230. **Saha, M. N.** and **Rai, R. N.**—On the Propagation of Electromagnetic Waves through the Earth's Atmosphere. *Proc. Nat. Inst. Sci. Ind.*, IV, pp. 53–67, (1938).

The paper is one of a series of papers dealing with the wave-treatment of the problem of propagation of electromagnetic waves in the ionosphere, as opposed to the ray treatment.

J. N. B.

231. **Saha, M. N.** and **Rai, R. N.**—On the Ionisation of the Upper Atmosphere. *Proc. Nat. Inst. Sci. Ind.*, IV, pp. 319–336, (1938).

It has been shown that the two theories of upper air ionisation, viz. that of Pannekoek and Chapman, are not essentially different from each other. When in the Chapman theory we give to the quantity β, which is introduced as a proportionality factor for deducing the number of electrons from the radiation absorbed, the value $\frac{1}{h\nu}$, and extend it to continuous radiation, we come to Pannekoek's results. For absorption coefficient $\tau(\nu)$, a wave mechanical formula is used in the place of the Kramers-expression. Rates of production of electrons from the O-atoms, the recombination coefficient of ions and electrons, and equilibrium values of electron concentration are deduced for unicomponent systems. From these expressions, Chapman's formulae for variation of electron-production with height is deduced as a special case but the scope of the formula is found to be greater as it is found to hold not only for monochromatic light, as in Chapman's, but also for continuous light. Actual values of electron production at noon for the F-layer from the O-atom are given, and compared with figures given by Appleton.

It is further shown that the method is capable of giving also formula for electron production by monochromatic light, and yields results in terms of quantities which are physically definable. M. N. S.

232. **Sharan, S.**—Magneto Resistance Change of Ferromagnetics in Alternating Magnetic Field. *Ind. Journ. Phys.*, XII, pp. 203–210, (1938).

The resistances of nickel and Ni-iron permalloy have been studied under the effect of an alternating magnetic field alone and also under the effect of an alternating and a direct magnetic field simultaneously. It has been observed that the application of a gradually increasing alternating field in the absence of a direct field produces no change in the resistance of the specimen, until it has a value equal to the coercive field of the specimen; and if the alternating field is increased beyond this value the resistance increases in the same way as it does in the case of the direct field. In the presence of a direct field, the alternating field first causes a decrease in the resistance and after a certain value has been reached, corresponding to which the resistance is minimum, the resistance begins to increase as usual. A definite relation has been observed between this particular value of the alternating field and the direct field. Further, it has been observed that the resistance of the specimen increases beyond its original value at zero alternating field, only when the alternating field is greater than the sum of the direct field and the coercive field of the specimen. Theoretical explanation of the above observations has been given. S. S.

233. **Singh, B. N.**—Effect of Longitudinal Magnetic Field on Conductivity and Refractive Index of Ionised Air. *Phil. Mag.*, XXVI, pp. 244–252, (1938).

Conductivity and refractive index of ionised air have been determined in the presence of applied longitudinal magnetic field. The measurements were made with ultra-short waves of frequency $8 \cdot 1 \times 10^7$ cycles per sec. passing through a discharge-tube containing the ionised air. Variations of the above constants were found as the magnetic field was increased. A complete dispersion formula of the ionised gas in the presence of the magnetic field has been employed for the purpose of verifying the experimentally observed values of the above constants. The values of electron density N and collisional frequency ν were determined by the 'probe' method of Mott-Smith and Langmuir. It has been found that the values of conductivity and refractive index do not reach infinity at about gyro-frequency of the incident wave when the magnetic field is increased, as is generally expected from the approximate formulae obtained by neglecting the collisional frequency.

B. N. S.

234. VENKATASUBBAN, A., RAO, M. V. K. and SREENIVASAYA, M —Dielectric Strength of Lacs of Known Origin. *Current Science*, VII, pp. 49–51, (1938).

The note contains results of experiments carried out by the authors with a view to ascertaining the electrical properties of lac from different hosts.

J. N. B

RADIO-ACTIVITY.

235. BARDHAN, N. C.—Nuclear Structure of Radio-active Substances. *Phil. Mag.*, XXV, pp. 1033–1401, (1938).

The author describes an investigation made by him on the variation of the surface potential of the hard core of radio-active elements. The investigation is based on Kar's theory of the spontaneous and artificial disintegration of atoms. The elements studied belong to Ra, Th and Ac families.

J. N. B.

236. BHABHA, H. J.—Nuclear Forces, Heavy Electrons and the β-Decay. *Nature*, CXLI, pp. 117-118, (1938).

Yukawa's theory has been generalised showing that the existence of new particles of mass about 200 times that of the electron can explain nuclear forces. The consequences of the theory have been discussed and it is claimed that these are of real significance for cosmic ray and nuclear phenomena.

J. N. B.

237. KAPUR, P. L. and PEIERLS, R.—Dispersion Formula for Nuclear Reactions. *Proc. Roy. Soc.*, CLXVI, Ser. A, pp. 277–295, (1938).

The dispersion formula of Bethe and Placzek, which expresses the cross-section for nuclear reactions in terms of the virtual levels of the compound nucleus and their widths, is derived without using the assumption that the motion of the incident particle within the nucleus can in any approximation be regarded as a one-body problem. It is possible to derive a formula of the type of the dispersion formula without any assumption at all about the mechanism of the reaction. However, in the general case this formula contains more parameters than the usual dispersion formula and is therefore of less practical value. The dispersion formula of Bethe and Placzek is shown to hold rigorously if only the widths of all virtual levels which contribute essentially to the expression are much smaller than the distances between the levels.

P. L. K.

238. SAHA, N. K.—Disintegration of Fluorine by β-Particle Bombardment. *Zeits. f. Physik*, CX, pp. 473–494, (1938).

An experimental study of the various nuclear processes involved, when Fluorine is bombarded with α-particles, is given. The excitation curves for the products of disintegration, viz., protons, neutrons and γ-rays, are shown and the resonance levels are determined for each process.

J. N. B.

ASTRONOMY AND ASTROPHYSICS.

239. **CHANDRASEKHAR, S.**—Ionisation and Recombination in the Theory of Stellar Absorption Lines and Nebular Luminosity. *Astrophys. J.*, LXXXVII, pp. 476–495, (1938).

In this paper the effect of collisions and photo-ionisations on monochromatic radiative equilibrium is considered. A formalism is developed which includes the theory of stellar absorption lines (Stromgren) and the theory of nebular luminosity (Zanstra) as two limiting cases. A second approximation for the nebular problem is also sketched. The mathematical analysis is devoted to the treatment of the three-state problem including collisions. When collisions can be neglected, the approximate equations of transfer used admit of two flux integrals and two K-integrals.

S. C.

240. **CHANDRASEKHAR, S.**—Integral Theorem on the Equilibrium of a Star. *Astrophys. J.*, LXXXVII, pp. 535–552, (1938).

In this paper an integral theorem on the equilibrium of a star is proved which gives the lower limit to the value of $P_c/\rho_c^{(n+1)/n}$, assuming that both ρ and $P/\rho^{(n+1)/n}$ do not increase outward. As a special case of the theorem ($n = 3$) it is shown that for a gaseous star of a given mass in radiative equilibrium, in which ρ and $(1 - \beta)$ do not increase outward, the minimum value of $1 - \beta_c$ is the constant value of $(1 - \beta)$ ascribed to a standard model configuration of the same mass. For $n = \infty$ the theorem gives the minimum central temperature for a gaseous star with negligible radiation pressure.

S. C.

241. **CHANDRASEKHAR, S.**—Generalisation of Lindblad's Theory of Star-Streaming. *M. N. R. A. S.*, XCVIII, pp. 710–726, (1938).

The treatment of the observed stellar motions shows that the axis of preferential—the largest axis of the velocity ellipsoid—lies in the galactic plane and is directed towards the galactic centre (this is the radial axis). On the other hand, the theoretical study of stellar systems, with cylindrical symmetry and assumed to be in a steady state, has hitherto led to the result that the radial axis and the axis perpendicular to the galactic plane (the polar axis) are equal. By a generalisation of Lindblad's theory of star-streaming the paper removes this inconsistency and demonstrates that, for a steady state of the system, the radial and polar axes are unequal. The paper also predicts for a group of stars at a considerable height above the galactic plane a definite tilt of the principal axes of the velocity ellipsoid in the meridian plane; in other words, the greatest axis is no longer parallel to the galactic plane.

S. C.

242. **CHANDRASEKHAR, S., GAMOW, G. and TUVE, M. A.**—Problem of Stellar Energy. *Nature*, CXLI, p. 982, (1938).

A report of a discussion on the problem of stellar energy held at the Annual Conference on Theoretical Physics sponsored by the George Washington University and the Carnegie Institution of Washington.

J. N. B.

243. **DATT, B.**—Non-Statistical Solutions of the Gravitational Equations of Relativity. *Zeits. f. Physik*, CVIII, pp. 314–321 (1938).

The author discusses the problem of a universe composed of discontinuous matter of variable density but symmetrical with respect to origin. The distribution of matter is found to be:

$$-8\pi\delta_{00} = -2(3\psi + r\psi')/e^{3\mu/2}(r\mu' + 2),$$

where ψ is a function of r and $\mu' = d\mu/dr$. Solutions for various distributions are also given.

J. N. B.

244. **Khan, M. A. R.**—Physics of Meteoric Phenomena. *Current Science*, XII, pp. 635-636, (1938).

The author gives an account of observed meteoric phenomena and discusses the different theories suggested to explain them.
J. N. B.

245. **Khan, M. A. R.**—A Lunar Halo with Partial Parhelic Circle and 'Horizontal' Arcs seen at Hyderabad. *Science and Culture*, IV, p. 133, (1938).

The author reports the observation of an unusual lunar halo witnessed by him at Begumpet, Deccan, in the early morning of June 24, 1938.
J. N. B.

246. **Kothari, D. S.**—Theory of Pressure-Ionisation and its Applications. *Proc. Roy. Soc.*, CLXV, Ser. A, pp. 486–500, (1938).

The main results which have been obtained from the application of the theory of pressure-ionisation may be summarised as follows: (i) The theory predicts that the stellar material in the interior of the white dwarf stars should be fully ionised. (ii) It predicts the existence of a maximum radius for a cold body. The value of this maximum radius is about the same as the radius of the planet Jupiter. There cannot be a 'cold' body (planet or white dwarf) larger in size than Jupiter. (iii) The theory shows that the two heaviest planets (Jupiter and Saturn) have cores composed of metallic hydrogen. The terrestrial planets have cores of much heavier metal, possibly iron.
D. S. K.

247. **Kothari, D. S.** and **Singh, B. N.**—Relation of Electron Gas Pressure to Radiation Pressure in Degeneracy and Non-Degeneracy. *Zeits. f. Astrophysik*, XV, pp. 143–153, (1938).

The relation between gas pressure and radiation pressure is discussed in detail. It is shown that for degeneracy the gas pressure must be larger than the radiation pressure, though a gas pressure large compared with radiation pressure does not necessarily imply degeneracy. For non-degeneracy there is no restriction on the ratio of gas to radiation pressure, though a gas pressure small compared with radiation pressure necessarily implies non-degeneracy.
D. S. K.

248. **Kothari, D. S** and **Singh, B N**—Relation of Electron Gas Pressure to Radiation Pressure in Degeneracy and Non-Degeneracy. *Zeits. f. Astrophysik*, XVI, p. 200, (1938)

Corrections to the original (see preceding Abstract).

249. **Mukerji, B. C**—Possibility of Expansion of a Slowly Rotating Spheroidal Mass of Incoherent Particles under Gravitational Forces. *Zeits. f. Astrophysik*, XV, pp. 1–13, (1938).

Assuming a slowly rotating flat spheroidal nebula to be constituted of a system of gravitating mass particles exerting negligible pressure and to be of nearly permanent shape, the trajectory of a particle in the internal gravitational field of the nebula has been calculated. It is found that a closed elliptic path of the Newtonian field has up to the order of ω^2, ω being angular rotation, no tendency to expand but is only subject to a perihelion rotation of amount calculated.
B. C. M.

250. **Sen, P.**—Internal Constitution of Planets. *Zeits. f. Astrophysik*, XVI, pp. 297–303, (1938).

The theory of pressure ionisation, as has been shown by Kothari and Majumdar, when combined with the usual theory of the white dwarf stars predicts a maximum radius for a cold body and explains the broad features of the constitution of planets.

Kothari has discussed two extreme cases when the material composing the planets is all H or Fe. In the present paper the mass-radius relation is calculated for the case of CH_4, NH_3 and H_2O. The method is indeed very rough but it serves to show how the theoretical (M, R) relation is modified when the chemical composition is changed. The theory suggests that the outer planets are probably composed of CH_4 and NH_3 with a proportion of H_2 and the terrestrial planets have cores of heavier elements.

P. S.

251. SMART, W. M. and CHANDRASEKHAR, S.—Method of Deriving Constants of Velocity Ellipsoid from Observed Radial Speeds of Stars. *M. N. R. A. S.*, XCVIII, pp. 658–663, (1938).

A method is developed, based on Schwarzschild's hypothesis, for the determination of the constants of the velocity ellipsoid (with two equal axes) from the observed radial speeds of the stars.

S. C.

252. VENKATESWARAN, C. S.—Induction Brake Control for an Astronomical Drive. *Journ. Sci. Instruments*, XV, pp. 265–267, (1938).

A fine control for astronomical driving clocks, based upon the principle of electromagnetic induction, is described.

C. S. V.

VII. BOTANY

(including Pure and Applied Botany, Forestry and Agronomy).

General.

1. **Alam, Ch. Nek**—An important genetic constant. *Current Science*, VII, No. 2, pp. 58–59, (1938).

Taking the published data of several workers, and working out hundreds of them, it has been found possible to find that a definite relation exists not only between the parents, F_1 and F_2 but it also exists between the parents and any two successive generations. In all the cases worked out, it was found out that the sum of the averages of any quantitative character of both the parents and the F_1 was more or less three times the average for the F_2. It was also observed that the value of this constant holds good whether the average value of the F_1 was intermediate, more or less than either of the parents.

Once the value of the constant is known, it is possible to predict the values of F_3, F_4, etc. From the data of the parents and the F_2 taking A and B as the average values of the parents and 3 as the constant, it is now possible to say that $A+B+F_1 = 3F_2$; $A+B+F_2 = 3F_3$; $A+B+F_3 = 3F_4$ and so on.

P. P.

2. **Anon.**—Trade names of Indian timbers. Revised third edition. *Ind. For. Rec.*, (U), I, (7), pp. 189–210, (1938).

The Record presents the official list of trade names of Indian timbers which if made use of by the Forest Officers and others will eliminate the confusion which exists from the use of local vernacular names, more especially in export and inter-provincial trade and in publications. Burma timbers not found in India, but imported into India, have been tabulated in a separate list at the end of this Record.

The new list of trade names is fundamentally the same as that published in 1934, but with a few necessary alterations, and the addition of several other common vernacular names in a separate column from the trade names.

D. S.

3. **Anon.**—Some common fallacies about wood. *Ind. For.*, LXIV (10), pp. 644–647, (1938).

Some common misconceptions about wood have been explained. They are: (1) that wood used in construction is under all conditions more dangerous than steel in case of fire; (2) that all wood in the case of time 'naturally' decay as a result of age; (3) that some wood *never* decay, regardless of exposure and service conditions; and (4) that there is such a thing as 'dry rot' of wood.

J. N. S. G.

4. **Anon.**—The promotion of private forestry in Finland. *Ind. For.*, LXIV (12), pp. 763–773, (1938).

Summarizes the report of a Commission, appointed by Government, to review the work done for promoting private forestry during 1929–36 and how the work of forest owners' associations could best be promoted. Past work is recognized as a development of very great significance and future proposals are based on two main considerations viz.: (1) that the law concerning private forests should be so extended as to preserve and improve the value of forests, and (2) that the work of improving private forestry should be extended and all private forests should be placed under rational management.

J. N. S. G.

5. **Balandin**, V. N.—Plant indicators. *Ind. For.*, LXIV (8), pp. 512–516, (1938).

In expressing his ideas on the question of plant indicators, the author believes that a correct formulation and solution of that question is closely connected with the elaboration of the fundamental methods and with a thorough reconstruction of phytogeography on the basis of the Marxist-Leninist theory. Modern plant physiology and ecology prove convincingly that a vegetative organism is very adaptive to the environment, which rules out the primitive theory of plant indicators 'based on the formal relations of plant and environment'.

J. N. S. G.

6. **Basu**, J. K. and **Sirur**, S. S.—Soils of the Deccan Canals, I. Genetic soil survey and soil classification: Nira right bank and Pravara Canals. *Ind. Journ. Agric. Sci.*, VIII, Part V, pp. 637–697, pls. liv–lvi, 8 figs., (1938).

The results are presented of a genetic survey of the soils of three of the major canals in the Bombay-Deccan, undertaken with regard to the problem of maintenance of soil-fertility under continued cane-growing and irrigation.

The natural soil-forming conditions of the tract are characterized by a low and precarious rainfall, extreme heat and desiccation in summer and generally wide fluctuations in the daily temperatures. Soil-climate and vegetation, however, are greatly modified by topography, which has thus played an important rôle in soil-formation and development. The geological formation from which the soils originate is the same, viz., the Deccan Trap, throughout, but it is likely that local differences in the chemical composition of the rock are responsible for further soil variation.

Eight distinct soil-types have so far been identified which show marked differences in their profile characteristics, physico-chemical properties and their field behaviour. They all show two to three soil-horizons more or less well-differentiated by colour, structure and texture. The processes involved in the formation and properties of these horizons and their bearing on practical agriculture are discussed. From a detailed consideration of their properties it is suggested that the Deccan soils may be assigned a new group in the world-group classification, viz., 'Immature Tropical Tschernosems'. A practical scheme of soil classification is proposed.

J. K. B. & S. S. S.

7. **Bor**, N. L.—The vegetation of the Nilgiris. *Ind. For.*, LXIV (10), pp. 600–609, (1938).

Reference is made to an earlier article by Mr. Ranganathan on the subject in which two climatic climaxes of such widely divergent life forms, as grassland and forest, were mentioned to co-exist in the Nilgiris against the current accepted views of most ecologists. These views are discussed in some detail, and it is concluded that the Shola forest is the relict of an evergreen forest climax which has been pushed back to its last stronghold by fire and grazing that have rendered stable the grassland which is only a biotic climax.

J. N. S. G.

8. **Bor**, N. L.—A sketch of the vegetation of the Aka Hills, Assam. A synecological study. *Ind. For. Rec.*, (B) I (4), pp. 103–221, maps 2, pls. 22, (1938).

The vegetation of the Aka Hills is described from a synecological standpoint, taking as the basis of nomenclature the system put forward by the American plant ecologist F. E. Clements.

After a preliminary descriptive survey of the area under discussion, the biotic factors are outlined and the various vegetational units are grouped into climax and seral communities.

The special realtions existing between vegetation and water in quantity are discussed in a chapter 'Hydroseral Communities'.

The very profound effect the activities of Man have upon vegetation, whether it be climax or seral, is demonstrated in chapters dealing with grazing, grasslands and vegetation near habitations.

An appendix is added with the object of correlating the views of the writer and those of Champion in his 'Preliminary Survey of the Forest Types of India and Burma'.

N. L. B.

9. Braithwaite, J. D.—Tree planting in Akyab, Burma. *Ind. For.*, LXIV (11), p. 697, (1938).

The Akyab Municipality financed a tree nursery next door to the D.F.O.'s house some 16 to 20 years ago from which numbers of ornamental and flowering avenue trees have since been successfully raised. They are mostly *Lagerstroemiaflos-reginæ*, *Casuarina*, *Poinciana regia* and *Cassia fistula*. Of late the Jail has also been maintaining a tree nursery for the same purpose.

J. N. S. G.

10. Champion, H. G. and Trevor, Gerald—Manual of Indian Silviculture, pp. 1–374, pls. 56, maps 2, (1938).

It is an authoritative and up-to-date book on Indian Silviculture, divided into two parts. 'In the chapters constituting Part I of this Manual, a rapid survey will be made of the climatic and soil conditions under which our forests grow (Ch. I) followed by an equally condensed account of the primarily botanical subjects of the form and growth (Ch. II), and physiological processes (Ch. III) of trees and crops. The natural development of forests and their reactions to the various agencies affecting them (Ch. IV) are generally treated as forest ecology, consideration of which completes the preliminaries to the essential part of silviculture, viz., the regeneration of forests either naturally (Ch. V) or artificially (Ch. VI), the establishment of forest on non-forest land, or afforestation (Ch. VII), and the tending of forest crops (Ch. VIII). The combination and application of the available information on all these subjects to a given forest area to cover its whole life-cycle with different methods of tending, harvesting and replacement, each method giving a forest of characteristic form, is dealt with in Part II on Silvicultural Systems'.

Part II follows the arrangement and exposition of Troup's *Silvicultural Systems* (Oxford, 1928) dealing in detail with the application of these systems to Indian Forestry, mostly derived from the author's personal experience and knowledge of the forests of India.

H. G. C. & G. T.

11. Chaudhuri, S.—Commercial aspects of the Sundarbans Division. *Ind. For.*, LXIV (10), pp. 636–644, (1938).

Most of the important species provide good timber and excellent fire wood that have a ready sale in the markets of Calcutta and lower Bengal. The minor forest products of the division, e.g. golpatta leaves (*Nipa fruticans*), honey and wax, shells, fish, skin etc., contribute about Rs.1·5 lakhs to the annual gross revenue. There is a great scope for salt industries that are gradually opening up.

J. N. S. G.

12. Chopra, R. S.—A rough guide to thinning deodar based on average spacing for a given girth. *Ind. For.*, LXIV (11), pp. 651–652, (1938).

In the deodar forests of qualities I and II in the Punjab, thinning intensity at each decade is regulated by four times the girth thumb-rule, i.e., the average espacement after each thinning approximates four times the mean crop girth at breast height. Apart from being quite simple in practice, it compares favouarbly with the F.R.I. Multiple Yield Tables for deodar quality class I/II.

J. N. S. G.

13. Dabral, B. M. and Chiney, S. S.—Micro-climatology of an irrigated cotton field in Sind. *Ind. Journ. Agric. Sci.*, VIII, Pt. II, pp. 161–184, pl. vii, 14 text-figs., (1938).

Data on temperatures and relative humidity conditions recorded by means of an Assmann Psychrometer both inside and outside a cotton crop during the kharif season of 1935 at three typical heights above ground are presented and discussed.

During the earliest phase of growth, when the crop is young, irrigation reduces temperatures and increases humidity over the cropped bed to some extent. During the latter stages of growth the differences between the two environments are great, especially during the hours of the day.

Temperatures are highest at six-inch height above ground on a barren plot which decrease as the height is increased up to three feet to four feet. This tendency is reversed under cropped conditions specially when plants have covered up the soil wholly and have attained a height of three to four feet.

Soil temperatures show wider differences. The uncropped open beds show about 8°–10°C. higher temperatures than the cropped ones for a few days after irrigation. The tendency of the temperatures to run closer as the soil gets drier is seen in all phases of growth. The lowest soil temperatures are reached just after a few days of irrigation.

The figures of temperatures and relative humidity from instruments exposed at four feet height in the Stevenson Screen nearby do not show real conditions inside a crop. The most dominating feature of the microclimate of the cotton field under irrigation is the periodic fluctuation due to the intervals of irrigation. This rhythm is superimposed over the daily drift observed in ordinary air temperatures. The influence of crop growth lies in creating shade conditions inside.

B. M. D. & S. S. C.

14. De, Pran Kumar and Bose, Nripendra Mohan—A study of the Microbiological conditions existing in Rice soils. *Ind. Journ. Agric. Sci.*, VIII, Part IV, pp. 487–498, (1938).

The objects of this investigation were (I) to study the changes in the numbers and in the activities of different groups of micro-organisms in soils under conditions similar to those occurring in the rice fields of India, and (II) to ascertain the extent to which the microbiological conditions of a soil, dried after a long period of water-logging, may differ from those obtaining under dry cultivation. (1) To obtain conditions corresponding to those occurring in the rice fields at different seasons of the year, soils were first kept water-logged (water-logging period), then quickly dried and maintained under optimum conditions of temperature and moisture (dry period), and finally kept at high temperature (50–54°C.) without adjustment of moisture (desiccating period).

Soils at different stages were periodically examined for (1) total bacteria, (2) total fungi, (3) nitrifying capacity, (4) *Azotobacter* numbers, and (5) nitrogen-fixing capacity.

Bacterial and fungal numbers.—The numbers of bacteria and fungi were markedly reduced after the soils were water-logged, particularly at a later period of water-logging. They again increased in the 'dry period', but the level in all cases, except one, was lower than that at the start. In the 'desiccating period' there was considerable reduction in both bacterial and fungal numbers.

Nitrifying capacity.—The nitrifying capacity of the soils was considerably reduced during the early period of water-logging, but at a later period the values again increased. In the 'dry period' the values were even higher than those at a later period of water-logging, but in the 'desiccating period' the soils nearly completely lost their nitrifying capacity.

Azotobacter numbers and nitrogen-fixing capacity.—Both *Azotobacter* and nitrogen-fixing capacity decreased during the early period of water-logging, but at a later period they again increased and remained nearly at a constant level till the end of the 'desiccating period'. It is significant that *Azotobacter* was not much affected by the conditions prevailing at 'desiccating period'.

(2) Previous water-logging of a soil for a long period was found to have no influence on the activities of ammonifying and nitrifying organisms, when it is subsequently dried; but evidence was obtained which suggests that its effect on some of the micro-organisms of the soil may be depressing.

P. K. D. & N. M. B.

15. Edwards, M. V.—Effect of burning slash on soil and succeeding vegetation. *Ind. For.*, LXIV (7), pp. 438–443, (1938).

The effect of burning slash on soil and succeeding vegetation is discussed from the aspects of effect on mineral constituents of the soil, giving references to work done in several countries. Burning the vegetation returns to the soil all the mineral elements taken out by the plants during life. It was found that burning and the resulting formation of basic ash materials increased the nitrification and resulted in an increase in the soluble mineral constituents of the soil, but destroyed the humus layer. Continuous and repeated burning, however, is not considered to improve forest fertility.

J. N. S. G.

16. **Garland, E. A.**—Forests and Man. *Ind. For.*, LXIV (2), pp. 107–112, (1938).

Talk broadcast from Bombay (V.U.B.) on 25th July, 1937, describing the effects of forests on the formation of man's philosophies and religions through the ages, the assistance which wood has been to man in the development of his civilization, and the life led by a forest officer in India.

E. A. G.

17. **Garland, E. A.**—The future of forests. *Ind. For.*, LXIV (3), pp. 181–185, (1938).

This broadcast talk, given from Bombay (V.U.B.) on 26th September, 1937, sketches in rough outline the part which forestry is capable of playing throughout the world in the development of the resources of the soil in the most economic manner. It admits the futility of any attempt to prophesy what may happen, politics all over the world being in their present uneasy state, but indicates some of the ways in which forests could, and should, contribute to man's well-being. Crops of trees and grasses are not only essential in some climatic and physiographic conditions, they are also capable of development, like any other agricultural crops, as the basis of raw materials for industries. To grow trees and establish their associated industries can also automatically involve the creation of living conditions for the workers which tally closely with the modern ideal. This transposes the old Latin tag '*rus in urbe*' into '*urbs in rure*'. Japan already practises what we preach.

E. A. G.

18. **Gorrie, R. M.**—Soil losses from Indian Forest Grasslands and Farms. *Ind. For.*, LXIV (6), pp. 327–329, (1938).

Reliable run-off figures for forest and grassland obtained in experiments in the Punjab are published. Bare soil with the grass clipped every 3 days showed more than four times the loss of soil compared with grass cover or grass with shrubs. The run-off of water was also two to five times greater in the bare soil plots.

M. V. L.

19. **Gorrie, R. M.**—The conservation of Punjab water supplies. *Ind. For.*, LXIV (11), pp. 675–687, (1938).

Discusses how large parts of the Punjab foothills are being practically obliterated by erosion caused principally by destruction or alteration of the natural plant cover, resulting principally from grazing (being the most widespread and most insidious) and also from the system of field cultivation with clearfelling and burning prevalent in the foothill as well as high hill areas where contour trenching is unknown. Different types of erosion damage are also discussed under (*a*) sheet washing plugs soil poles, (*b*) soil is early robbed of its valuable chemicals, and (*c*) gullying destroys subsoil moisture reserve with details of recommendation for control. There are vast possibilities for improving water conservation everywhere by the American method of 'upstream engineering', better farming practices and better control of live stock to prevent overgrazing.

J. N. S. G.

20. **Griffith, A. L.**—Notes on a tour in South Bengal in November-December, 1936, pp. 1–36, pls. 22, (1938).

Observational notes of the author who toured (with the Central and Provincial Silviculturists) in the forests of Sunderbans, Chittagong, Cox's Bazar and Chittagong Hill Tracts of South Bengal with the object of studying the work in progress in the regeneration of evergreens, including teak, *Hopea* and mahogany plantations. General conclusions have also been drawn in so far as they could be applicable to silvicultural operations in Madras with special reference to the natural and artificial regeneration of similar evergreen forests.

J. N. S. G.

21. **Hakimuddin, M.**—Fence posts. *Ind. For.*, LXIV (12), pp. 749–750, (1938).

With reference to an earlier article on 'Treating Fence Posts by means of old inner tubes', the author advocates a still cheaper and simpler method of increasing the life of wooden posts in India by scorching (to a depth of about ½ inch) the lower ends of such posts after removing their bark. The Utilization Officer of the Forest Research Institute adds that the protection of wood by scorching or charring is a very old form of wood preservation originating in the ship-building industry. Charring is a good form of preservation for a limited period of time.

J. N. S. G.

22. **Hodge, W. E.**—History of the Mal Block of the Kalimpong Division. *Ind. For.*, LXIV (9), pp. 583–589, (1938).

Describes how this block, which has had a bad reputation as the worst type of forest, could under systematic management improve vastly towards establishing promising crops of important species.

J. N. S. G.

23. **Hutchinson, J. B.** and **Govande, G. K.**—Cotton Botany and the spinning value and hair properties of cotton lint. *Ind. Journ. Agric. Sci.*, VIII, Part I, pp. 21–47, (1938).

The technological data available for standard Indian cottons have been analyzed according to botanical relationships. It is shown that the different botanical types differ greatly in mean spinning values and hair porperties. The greatest differences are between the short, coarse, low-spinning *G. arboreum* var. *neglectum* forma *bengalensis* of Northern India, and the other botanical groups. The other groups differ in hair-weight, the Uplands being the finest and the *herbaceums* the coarsest, but have very similar hair-lengths and spinning values.

The data show that the reputation of India as a producer of coarse-stapled cotton depends almost entirely on one of the four botanical types now cultivated. As it has already been shown (Hutchinson and Ghose, 1937, I; Hutchinson, 1937) that the coarse northern *arboreum* type has invaded most of the areas in which it now predominates in quite recent times, it is concluded that India has become a porducer of coarse cottons by force of economic circumstances, and not on account of any inferiority in her indigenous cottons.

It is shown that the introduced Upland cottons differ very little from the superior indigenous types in spinning value. If adequate botanical and technological surveys are made of the range of variability available in the indigenous species, improvement in quality is likely to be attained as rapidly with them as with exotic types.

The relative importance of differences in crop variety and in environment is examined, and it is shown that differences in hair properties and spinning value due to differences in environment are very small compared with those due to crop variety. Also, correlations between hair properties and spinning value are very much higher when calculated from differences in crop variety than from differences in environment. This is fortunate from the plant breeding point of view, since it minimizes the errors which will arise from the estimation of strain differences in spinning value from hair characters measured on small quantities of cotton from progeny rows.

The swollen hair diameter method of determining fineness is discussed, and it is concluded that, if it is satisfactory after more extended trial, it will put the quantitative study of fineness within the reach of the plant breeder. Its importance is emphasized in enabling the plant breeder to select for high ginning percentage without the risk of loss of quality.

J. B. H. & G. K. G.

24. **Kapur, S. N.**—Notes on some wood-working industries in the Punjab. *Ind. For.*, LXIV (7), pp. 401–419, 2 pls., (1938).

With a change in Indian requirements due to the effect of Western civilization, a number of new woodworking industries have sprung up in the Punjab, such as the manufacture of wooden heels for ladies' shoes, gramophone and radio cabinets, bobbins, shuttles and other requirements for hand and power looms, picture frame mouldings, electrical casings, etc. Some of these newly developed industries are briefly described in the paper, discussing their economic aspects, and indicating the woods that have been found suitable for particular purposes. It is suggested that a country-wide survey of the existing wood working industries should be carried out, to collect information on their technical and economic features, in order to be able to further their growth, and to introduce new industries in the country.

S. N. K.

25. **Kessell, S. L.**—Effect of burning of slash on soil and succeeding vegetation. *Ind. For.*, LXIV (7), pp. 443–445, (1938).

According to modern trends of thought and practice in Australia fire is no longer considered essential for the reproduction of Eucalyptus there. A strong surface fire will, on the contrary, destroy practically all their seed except that carried by the trees at the time of the fire. Seedlings on and around ash beds derive benefit not only from the fertilizing value of the ash but also from the absence of grass and scrub competition for a long time on ash beds.

J. N. S. G.

26. **Kle.**—German forest policy and the forest tree nurseries. *Ind. For.*, LXIV (12), pp. 773–780, (1938).

It is recognized that Germany's present day forest policy requires a change from the state forest policy of former years on account of altered conditions of foreign exchange, trade and other economic factors consequent on political changes, e.g. re-incorporation of Austria, etc.

J. N. S. G.

27. **Krishnan, E. K.**—*Cammiphora Caudata* for the avenue. *Ind. For.*, LXIV (12), pp. 751–752, (1938).

This species, otherwise known as *Protium caudatum*, is said to be one of the easiest trees to propagate from stem and branch cuttings. The writer's experiments since 1924 have given cent per cent success with such cuttings inspite of careless handling and even in unfavourable seasons. Such cuttings were 6′ long, 2″-3″ in diameter, only 2′ of the stem length being embedded firmly in soil, watered for a week or two if weather was droughty. Even 10 ft. long × 2″ diameter top branches with leaves intact, planted during end of May, gave successful results. Its wood, however, is useless for any purpose and the leaves are unpalatable to cattle.

J. N. S. G.

28. **Limaye, V. D.**—Wood for sports goods. *Ind. For.*, LXIV (8), pp. 482–485, (1938).

Wood is, by far, the most important material employed in the manufacture of a variety of articles used for sport and amusement. That Indian manufacturers are taking a keen interest in the production of these goods is evident from the number of enquiries received by the Forest Research Institute for advice regarding suitable Indian woods for their manufacture. Sports goods can be divided into several groups, each requiring timbers with different qualities. It is the intention in this short note to give a general idea of the Indian timbers that are being used at present, or that could be utilized, in this field.

V. D. L.

29. **Mascarenhas, L. P.**—Forests of Janjira State. *Ind. For.*, LXIV (3), pp. 160–168, (1938).

Briefly describes the geology, climate and forests of Janjira State. The forests are a moist mixed deciduous type, *Tectona grandis, Dalbergia latifolia, Terminalia tomentosa, Grewia tiliaefolia* being the chief species. Past management is described. The forests are worked chiefly for firewood and poles on the simple coppice system, regeneration being supplemented artificially by sowings.

M. V. L.

30. Mayuranathan, P. V.—The original home of the coconut. *Journ. Bombay Nat. Hist. Soc.*, XL, No. 2, pp. 174–182, (1938).

The author has attempted to trace the antiquity of the coconut in India and to locate its native home by taking into consideration the geological history and botanical and biological evidence with philological and ethnological issues. He remarks that mention is made of it in several of the Puranas after the Vedas. These references prove the great antiquity of the coconut in India but do not show that it is native to the country. He has discussed different views regarding the original home of the coconut from various standpoints and has come to the conclusion that the original home of the coconut is some island of the West Pacific, possibly the land now under the waves but which once formed part of ancient Papua. It started from the shores of ancient Papua land and the North-East monsoon carried it into the Bay of Bengal.

P. P.

31. Misra, R. D.—Edaphic factors in the distribution of aquatic plants in the English lakes. *Journ. Ecology*, XXVI, No. 2, pp. 411–451, figs. 6, (1938).

The distribution of aquatic plants in the English lakes has been studied with particular regard to the nature of the substratum.

Physical and chemical characters of the lake muds have been found to be closely correlated with the vegetation on them. This view is supported by suitable culture experiments done in Lake Windermere.

The source, its distribution on the lake floor and nature of the organic matter have been given in some detail. A relationship with the quantity of organic matter in the substratum and plant successions has been shown.

An analysis of carbon and nitrogen ratio of the substratum shows that in general this ratio is high (12–20) although the ratio for submerged plants is low.

Decomposition of organic matter in submerged muds has been shown to be chiefly anærobic. During this process a large amount of marsh gas and some carbon dioxide are produced. Oxygen if available is rapidly absorbed.

Sulphides have been shown to be present in appreciable amounts in practically all the submerged muds containing more than 5–10% of organic matter.

Nitrates are absent from the substratum and nitrogen is available for the aquatic plants in the form of ammonia.

A modification of Comber's thiocyanate test has been devised to measure the amount of easily replaceable ferrous iron and the reductivity of the muds.

By measurements of oxidation-reduction potential the highest reduction intensities are found to exist in soils of moderate organic content. These are most fertile, contain most available ammonia and the least replaceable hydrogen.

The exchangeable bases (with N ammonium chloride) in the muds are related to the organic content of the mud.

In general, a better relation with plant distribution is shown by the bases leaching into water under anærobic conditions. There is evidence, as the substratum becomes more organic, of increased availability of calcium and nitrogen. The sterility of most organic soils is attributed to absorption of ferrous iron and to lower available nitrogen. These conclusions are based also on analyses of plant material.

R. D. M.

32. Mitra, Anil—The origin of wheat and a few other cultivated plants. *Science and Culture*, III, No. 12, pp. 643–647, (1938).

The author summarizes the observations of N. I. Vavilov who, after a careful study of the spreading of the different varieties of wheat in the world, concluded that the present day cultivated wheats have a dual centre of origin—the hard wheats originated in Abyssinia and the soft wheats in Afghanistan. Further, he has come to a surprising conclusion 'that mountainous districts were the home of agriculture than the traditional view of river basin areas'. He has shown that there are only 5 centres of origin for all the cultivated crops, all situated in mountainous regions:—(1) South-west Asia for bread wheat, rye, etc., (2) South-east Asia for millets, rice and sugarcane, (3) Coastal regions of the Mediterranean for Emmer wheat and flax, (4) North-east Africa for hard wheat and barley, and (5) Central and South America for maize, potato and tobacco.

P. P.

33. **Mitra, B. N.**—Effect of drying on shrinkage of wood. *Science and Culture*, IV, No. 6, p. 359, (1938).

It has been levelled in certain quarters that the total shrinkage in similar specimens of wood and for equivalent moisture content is identical irrespective of the processes of drying. The author remarks that this view is untenable both on theoretical grounds and practical observations.

He has calculated the total radial shrinkage and the total tangential shrinkage of a variety of Indian timbers and has found that the shrinkage is different in different processes of seasoning and the tangential shrinkage is in every case higher than the corresponding radial shrinkage for equivalent moisture contents.

When the wood is air-seasoned, the rate of drying is very slow and shrinkage is very high. On the other hand when drying takes place under rather warm and humid conditions, as in the kiln-drying process, shrinkage is certainly less.

P. P.

34. **Mitra, B. N.**—Fibre saturation point of wood. *Science and Culture*, IV, No. 4, pp. 253–254, (1938).

In this paper the author has given the definition of fibre saturation point of wood and determined it by three different methods, namely shrinkage, electrical resistances and thermal conductivity. He has experimented on various kinds of timbers and remarks that fibre saturation point of the timbers lies roughly between 23 to 33 per cent moisture content.

P. P.

35. **Mooney, H. F.**—A synecological study of the forests of western Singhbhum with special reference to their geology. *Ind. For. Rec.*, (S) II (7), pp. 259–356, pls. 21, map 1, (1938).

This paper attempts to classify on an ecological basis the chief types of forest vegetation met with in the western half of Singhbhum District, where the natural flora has suffered least disturbance by man. Attention is drawn to the various factors influencing the distribution of species but special emphasis is laid on the important rôle played by geology in determining vegetational changes in an area where the climate varies within narrow limits. The relation of the principal communities to the climatic climax is examined and their ecological status indicated, details of their floristic composition being given in some detail. Secondary succession is discussed and an endeavour is made to trace the cause of the more important subseres.

The main types of forest described are:—(i) Driest type (*Cochlospermum-Euphorbia*), (ii) Dry mixed deciduous (*Mitragyna-Anogeissus, Dendrocalamus, Daedalacanthus*), (iii) Open grassy dry *Shorea robusta* mixed types (*Shorea-Anogeissus-Woodfordia*), (iv) Open grassy dry *Shorea robusta* type (*Shorea-Gardenia-Pollinidium*), (v) High level plateau *Shorea robusta* (*Shorea-Bauhinia-Themeda*), (vi) Moist hill *Shorea robusta* (*Shorea-Wendlandia-Indigofera*), (vii) Valley *Shorea robusta*, (*Shorea-Flemingia-Imperata*), (viii) Damp valley *Shorea robusta* (*Shorea-Polyalthia-Croton*), (ix) Moist mixed forest (*Terminalia-Mallotus-Combretum*), (x) Low level evergreen forest (*Mangifera-Amoora-Uvaria*), (xi) High level evergreen (*Michelia-Meliosma-Anodendron*), (xii) Damp ravine or swamp type (*Licuala-Melastoma-Scleria*).

M. V. L.

36. **Pring, N. G.**—Single Tree Silviculture in Indian Forests. *Ind. For.*, LXIV (1), pp. 52–53, (1938).

Criticizes Dr. Gorrie's article (*Indian Forester*, October 1937), advocating free thinnings, on the basis of the danger of selecting the final trees so early, the loss of increment and value on the whole crop, and the difficulty in utilizing the trees other than the 'élites'.

M. V. L.

37. **Ramdas, L. A., Satakopan, V. and Rao, S. Gopal**—Agricultural meteorology: Frequency of days with hail-storms in India. *Ind. Journ. Agric. Sci.*, VIII, Part VI, pp. 787–805, figs. 14, (1938).

The paper describes briefly the mechanism of hail-storms. Reports of occurrences of hail-storms from 141 meteorological stations distributed all over India are collected together for a period of thirty-eight years (1898–1935). The total number of occasions reported for each month of the year and for the year as a whole during the above period is computed. From these data the number of occasion per 100 years is also computed. These are called the 'Frequency of number of days with hail-storm in 100 years'. The frequencies for the various stations are plotted on a map for each month and lines of equal frequencies are drawn showing the regions of equal intensity. Another map showing the annual frequencies is also drawn. These maps are discussed from a climatological point of view indicating the liability of different parts of India to the incidence of hail-storms in different months of the year and the year as a whole.

Taking the year as a whole we find that the annual frequency is up to ten per year over the Western Himalayan region, and up to five per year over the Eastern Himalayan region and the mountainous tracts of the North-West Frontier; this decreases rapidly to once in two years over the adjoining plains. Over Lower Bengal a hail-storm usually occurs once a year. The area consisting of the Central Provinces and the adjoining districts of Bihar and the United Provinces forms another centre of frequency of the order of once a year. The Coastal tracts of the Peninsula are regions where hail-storms are comparatively rare.

L. A. R., V. S. & S. G. R.

38. RANGANATHAN, C. R.—Studies in the ecology of the Shola grassland vegetation of the Nilgiri Plateau. *Ind. For.*, LXIV (9), pp. 523–541, (1938).

The natural vegetation of the plateau is a mixture of temperate evergreen forest (shola), its seres and grass. The grasslands are very extensive and are practically confined to the western plateau which is subject to annual ground frost. Here the shola is reduced to small, isolated woods occupying folds and hollows on the slopes. The shola is relatively more abundant on slopes protected from the morning sun. The absence of fringing forest along perennial water-courses is a feature of the frost zone. The study of the altitudinal zonation shows shola to be the forest climax. Various considerations, such as its known antiquity and stability, indicate that the grass is also a natural climax. The relative distribution of the two climaxes is governed by the incidence of frost. Frost damage on the Nilgiris is confined to young plants and is probably a species of wilting effect due to plants exposed to the morning sun being unable to draw water from the frozen soil. The shola occupies slopes protected from the morning sun and sites where the danger of freezing is neutralized by abundant moving soil water. The grass though destroyed by frost revives quickly owing to its perennial root stock and its ability to spread vegetatively.

C. R. R.

39. SABHARWAL, L. R.—Effect of burning of slash on soil and succeeding vegetation. *Ind. For.*, LXIV (2), pp. 81–82, (1938).

Indian experience appears to be contrary to that reported from Germany (Fabricius) and by Heikinheino who showed that ash was never beneficial and often harmful, reducing germination per cent of tree seeds and development of the seedlings. For teak regeneration and dry forest regeneration ('rab work') burning is highly beneficial and considered essential, as also, for ecological reasons, in regeneration of *Shorea robusta* forests. It is suggested that the effect of fire in the tropics may be different from that in temperate regions.

M. V. L.

40. SARKAR, B. N.—A short history of sugarcane cultivation in Bihar up to the middle of the 19th century. *Agric. & Live-stock in India*, VIII, Part II, pp. 167–173, (1938).

In India sugarcane was first cultivated as a field crop of economic importance, and Bihar has always been perhaps the most important producer of cane-sugar and allied products all through history.

The results of recent researches show that sugarcane cultivation and the manufacture of most forms of sugar were as familiar in the 4th century B.C. to the cultivators of this province as they are to-day.

From the 8th century great development in sugarcane cultivation and manufacture of sugar in China and in the rapidly expanding Mohammadan empires was found.

By the beginning of the 15th century the European nations began to progress and, as in everything else, they began to take interest in sugarcane cultivation. And within the next hundred years sugar plantations were well established in all the European colonies.

Gradually Bihar fell from the position of perhaps the premier producer and supplier of sugar to the world to a position of only one unit out of so many.

A revolution in the cultivation of cane and manufacture of sugar which left the indigenous industry of Bihar far behind in point of efficiency was soon brought about.

Throughout the eighteenth century the history of sugarcane cultivation in Bihar is so confused that it is difficult to get a true perspective.

About the end of the eighteenth century an attempt was made to establish the industry on European lines. Several plantations and factories were started by Europeans in Tirhut and a few in South Bihar.

The first attempt to establish the industry on a sound basis failed due to various reasons. A unique opportunity soon offered itself to the sugarcane growers and sugar manufacturers of Bihar, with the emancipation of slave labour in 1838.

But the prosperity did not last long, for Bihar could not compete with the other parts of the world.

In face of various difficulties those of the planters who had taken up sugar were rapidly brought nearly to ruin in the middle of the 19th century.

P. P.

41. Sarup, Shanti—A review of the plant hybridizing work done in India. *Science and Culture*, III, No. 8, pp. 422–425, (1938).

The author reviews the work so far done in the improvement of Indian crops. Considerable work was done in wheat by Dr. and Mrs. Howard in producing high yielding varieties of wheat whose resistance to rusts also is more. Especially varieties Pusa 52 and 111 were highly praised as compared to Canadian wheats. Great attention was also paid to rice by workers in Coimbatore, Kajrat and Dacca, where a number of high yielding and fine strains were produced. The initiative given by Dr. Barber in sugarcane was ably followed by R. B. T. S. Venkataraman and resulted in the production of Co. 205, Co. 213, Co. 290, etc. which have widely spread throughout the United Provinces and North Bihar. Astounding success is claimed from crossing sugarcane with Jowar in reducing the life-cycle of sugarcane. Though some work was done in cotton, production of long stapled cotton with maximum ginning percentage still remains to be achieved. Hybrid No. 142 in tobacco has established its reputation as a suitable cigarette tobacco for India.

P. P.

42. Singh, B. N. and Das, K.—Distribution of weed species on Arable Land. *Journ. Ecology*, XXVI, No. 2, pp. 455–466, figs. 9, (1938).

In a statistical study of the distribution of individuals of twenty-one weed species made in small plots of arable land which were left fallow for *a short duration*, it is observed, by comparing with Poisson series terms and applying X^2 test, that with thirteen species the chances for random distribution are significant, while for the remaining eight species such a hypothesis is disproved.

Determination of the relative variance indicates, on the other hand, that all the species excluding *Corchorus acutangulus*, *Euphorbia hirta*, *Desmodium triflorum* and *Launœa nudicaulis* show a value which is slightly more than unity. The individuals of the majority of the species, therefore, are not distributed at random but show a small degree of aggregation.

Thus there is a disparity between the conclusions arrived at by the method of Poisson series determination with the use of X^2 test and of the relative variance. It may be concluded, therefore, that Poisson series estimations cannot bring out small degrees of heterogeneity in the distribution of individuals. It is suggested that for studies on the nature of distribution of individuals both the comparison with the terms of Poisson series and the determination of relative variance have to be made.

This is corroborated by the determination of the degree of heterogeneity made on the distribution of individuals of one species, *Bonnaya brachiata*, by employing Ashby's new technique and modified formula of comparing the observed and calculated empty squares in quadrate laid at random. Thus there is a good agreement between the results obtained by either relative variance or Ashby's empty square technique. The former method is, however, more rapid and hence advantageous but the latter is more precise.

B. N. S. & K. D.

43. **Sinha, J. N.**—State control over private forests in Finland. *Ind. For.*, LXIV (2), pp. 96–101, (1938).

Private owners of forests in Finland are not allowed to treat their forests as they like, but must obey the provisions of the 'Law Concerning Private Forests' (1917, revised 1928), which is enforced by the Private Forest Supervision Section of the Forest department. The functions of the Central Forestry Association and District Forestry Boards are described.

M. V. L.

44. **Sinha, J. N.**—Forest utilisation in Finland. *Ind. For.*, LXIV (10), pp. 609–611, pls. 3, (1938).

In few other countries is forest utilization so perfect as in Finland. Nature has benevolently allied itself with man. Extensive waterways transport logs from forest to mills and thence to ports of shipment almost for nothing. Efficient sawmills and pulp-mills utilize to the fullest extent all that the forest produces.

J. N. S.

45. **Smythies, E. A.**—Soil erosion problems in India. *Ind. For.*, LXIV (11), pp. 704–708, (1938).

Destruction of forest growth in mountain country, without compensatory terracing and regular cultivation, led to a tremendous increase of erosion, avalanches, destructive floods, etc. in very many countries. In the plains and foothill areas also the change of the once fertile lands into desert has been ascribed by many to the destruction of the natural vegetation by man and his cattle. Modern day examples of soil erosion due to over cultivation and excessive pasture have been cited from America, Africa and Australia. In the Jumna-Chambal basin in Northern India, between a quarter and a half million acres of land have had 20 to 40 feet depth of soil eroded, which represents a capital loss. Experiments carried out by the Forest department during the past 25 years in such areas have proved conclusively that control of grazing alone is sufficient to bring back the natural vegetation and check further erosion.

J. N. S. G.

46. **Stebbing, E. P.**—The man-made desert in Africa: Erosion and drought. *Ind. For.*, LXIV (7), pp. 454–456, (1938).

There has arisen some confusion as to what is actually meant by erosion in different parts of the world. The soil erosion being experienced in several parts of Africa is mainly attributed to over land utilization. The intensive wasteful utilization of the soil upsets nature's balance, resulting in an interruption of the water-supplies, including that of rainfall. It is suggested that when the erosion and rainfall have arrived at the Intermittent stage, amelioration works can no longer with safety be delayed. Closure of eroded areas to the practice of cultivation, to grazing and to firing will work marvels in Africa.

J. N. S. G.

47. **Trotter, H.**—Treating fence posts by means of old inner tubes. *Ind. For.*, LXIV (9), pp. 551–556, pls. 3, (1938).

Describes a cheap and simple method of treating green fence posts and other round green timber with water solution preservatives, by using pieces of old motor car inner tubes attached to one end of the posts. The method described is a simple modification of the well-known Boucherie process, and is well suited for fencing operations in the forest.

H. T.

48. **Venkata Rao, M. G.**—The influence of host plants on sandal and on spike disease. *Ind. For.*, LXIV (11), pp. 656–669, pls. 3, (1938).

Good and bad hosts of sandal can only be differentiated when grown individually with sandal. It cannot be based on the selective tendency of haustorium. Details are given of cases of (*a*) hosts which are easily killed by sandal, (*b*) toxic hosts which kill sandal, (*c*) hosts which cause discoloration in leaves of sandal, and (*d*) hosts which alter the habit of sandal. The sandal haustoria not only absorb the crude sap from host plants but often take up other ingredients found in the roots of host plants. Attempts at classifying any sandal-host combinations as 'more susceptible' and 'less susceptible' to the disease are considered futile and misleading, as the differences as regards resistance, if any, are generally slight and often not beyond experimental errors.

J. N. S. G.

49. WARREN, W. D. M.—Erosion. *Ind. For.*, LXIV (10), pp. 622–624, (1938).

Most of the hill streams in forest areas descend at steep gradients, which practically rules out gully plugging as an erosion control measure. The contour trenching, however, checks the run-off and provides favourable soil conditions for heavier vegetation, and by their mechanical action soil losses are reduced to a minimum.

J. N. S. G.

MORPHOLOGY.

50. AYYANGAR, G. N. RANGASWAMI, RAO, V. PANDURANGA and RAJABHOOSHANAM, D. S.—Sorghum. Size relationships of seed, embryo, seedling and the first seedling leaves. *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 151–156, figs. 4, (1938).

The seeds of *Sorghum* vary very much in their size. Seed size (length × breadth × thickness) is highly correlated to seed weight. The larger the seed the bigger the embryo, and the bigger the seedling that grows from it. In six varieties typical of different seed sizes the relationship between seed and seedling leaf measurements have been pursued. The first two seedling leaves are abnormal in shape, being much wider than long. In these two seedling leaves the width of the seedling is highly correlated with seed size. In the third seedling leaf the length of the leaf is beginning to be influenced by seed size. In this third leaf the midrib and ligular and auricular structures attain their full development.

G. N. R. A., V. P. R. & D. S. R.

51. AYYANGAR, G. N. RANGASWAMI, RAO, V. PANDURANGA and PONNAIYA, B. W. X.—Studies in *Sorghum*. The Non-Auriculate and E-Ligulate Condition. *Proc. Ind. Acad. Sci.*, VII, No. 6, Sec. B, pp. 286–288, (1938).

The occurrence of the non-auriculate and e-ligulate condition and its repurcussions on the earhead throw light on the homology between the leaf and the earhead. In non-auriculate and e-ligulate families, the leaves are more erect and the panicle branches likewise. With the suppression of the auricle and ligule there is an absence of the pulvinus and a shortening of the spikelet-free area in the panicle branches and branchlets. This leads to a choking overcrowding of the spikelets on the ear-head and consequent risk of sterility. In highly evolved sorghums with auricle and ligule, the presence of the pulvinus and pushing away of the grain-bearing area from the central axis have resulted in producing an economic earhead. These observations are wider in their import in that they throw light on the evolution of the Gramineæ.

G. N. R. A., V. P. R. & B. W. X. P.

52. AYYANGAR, G. N. RANGASWAMI, RAO, V. PANDURANGA and REDDY, T. VENKATARAMANA—Studies in *Sorghum*. Internodes and leaf-sheaths. *Proc. Ind. Acad. Sci.*, VII, No. 4, Sec. B, pp. 161–176, figs. 4, (1938).

In *Sorghum*, the longer the duration of the variety the taller the plant tends to be. In duration, *Sorghum* falls into three broad groups:—(1) Early, (2) Medium, and (3) Late. The number of internodes increases with the duration. In group (1) there is a *steady increase* in internodal length, the peduncle being always markedly long. In group (2) the internodes are *unimodal* in disposition, rising, slightly falling and then again rising up to the peduncle. Group (3) is *bimodal* with a double rise and fall, ending with the final rise towards the peduncle. The length of the leaf-sheath also follows these three systems of disposition, though in a less graphic measure. These internodal numbers and dispositions being season-conditioned are at their best constancy and individuality in their respective seasons. In inheritance, short-early plants of the *unimodal* disposition have proved a sharp and simple dominant to the *bimodal* tall-late group of plants. The tillers in each group that have a shorter growing period and a fewer number of internodes show an internodal disposition of the group lower than the main stalk group. The individual repeats the history of the race.

Minute morphological descriptions of the internode, the leaf-sheath, the axillary bud, the bloom band and the nodal band are given.

G. N. R. A., V. P. R. & T. V. R.

53. BARNES, EDWARD—Some observations on right and left-handed asymmetry in South Indian Aroids. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 183–190, (1938).

Observations on the right and left-handed asymmetry of the spathes of 30 species of aroids found in S. India have been made. In most species there are found to be about equal numbers of plants having right and left-handed spathes and it appears probable that observations on larger numbers would show this to be true of the others also. Some evidence has been obtained that each individual plant has a right or left-handed bias, but there appear to be exceptions.

E. B.

54. BOSE, R. D. and MISRA, S. D.—Studies in Indian fibre plants, No. 6. Phyllody and some other abnormalities in the flower of sunn-hemp (with plates xvi and xvii). *Ind. Journ. Agric. Sci.*, VIII, Part IV, pp. 417–423, (1938).

Phylloid flowers in sunn-hemp have been observed at Pusa and show the transformation of some or all floral whorls into greenish leaf-like structures. Twelve abnormal types of phylloid flowers have been recognized and are briefly described; all of these cause complete sterility of the plant. Two or more abnormal types of flowers may be developed on the same floral axis but the same plant does not bear normal flowers on some branches and phylloid flowers on others.

Proliferation of parts has been observed in some phylloid flowers. Adherence of vegetative shoots formed by the transformed stamen and the transformed carpel has also been observed. A case of fasciation was also observed in 1937 in the local sunn-hemp.

That phyllody in sunn-hemp may be due to a virus is suggested by the fact that the condition was transmitted by grafting normal scions on phylloid stocks and *vice versa.*

R. D. B. & S. D. M.

55. COOPER, R. E.—Phyllody in the flowers of *Crotalaria striata*, DC. N.O. Leguminosæ. *Journ. Univ. Bombay*, VI, pp. 57–61, (1938).

The phyllody of the flowers of *Crotalaria striata* DC. is described. It is suggested that petals, stamens and carpels are highly evolved types of leaves, though they often differ from foliage leaves in their configuration. These variations are clearly due to interaction of unknown factors, bad nutrition or parasitism, etc. Thus the phyllody of flowers in general is a symptom of disease, it is misbirth, the exact cause of which is not known in many instances.

R. E. C.

56. COOPER, R. E. and GONZALVES, ELLA—A note on some abnormalities in plants collected in Bombay. *Journ. Univ. Bombay*, VI, pp. 41–45, (1938).

Abnormalities in the following plants were observed:—

1. Double achene of *Anacardium occidentale* Linn. N.O. Anacardiaceæ.
2. Triple drupe of *Mangifera indica* L. N.O. Anacardiaceæ.
3. Tricarpellary pistil in the flower of *Saraca indica* L. N.O. Leguminosæ.
4. Abnormality in the flower of *Erythrina indica* Lamk. N.O. Leguminosæ.
5. An abnormal leaf of *Erythrina crista-galli* L. N.O. Leguminosæ.
6. Double drupe in *Terminalia chebula* Retz. N.O. Combretaceæ.

Where possible it has been attempted to elucidate the causes of these abnormalities.

R. E. C.

57. Datta, R. M.—On the Hermaphrodite flowers of *Morus Indica* Linn. *Science and Culture*, IV, No. 5, pp. 301-302, (1938).

The author came across certain forms of *Morus indica* Linn. which normally appeared to produce hermaphrodite flowers. This phenomenon was noticed for the first time in India. He noticed a marked variation in the number of stamens in hermaphrodite flowers collected from different localities. The number varied from 4 to 1.

These observations show how progressive reduction in the number of stamens has led to the production of unisexual flowers in the Moraceæ.

P. P.

58. De, R. N.—Sal inflorescence. *Ind. For.*, LXIV (2), p. 125, (1938).

Reports observations of different coloured inflorescences in *Shorea robusta*, and suggests the possibility of there being definite different varieties of the trees.

M. V. L.

59. De, R. N.—Sal inflorescence. *Ind. For.*, LXIV (8), pp. 502, (1938).

Mentions having observed in Goalpara District (Assam) sal trees standing side by side, not near any water, one carrying pink flowers, one cream and the third intermediate between the two. As for durability, the common belief is that redder wood is more durable.

J. N. S. G.

60. Deshpande, J. V.—The development of the sporocarp in *Salvinia* sp. *Current Science*, VI, No. 8, pp. 385-386, (1938).

The author has been able to detect the sporocarps in *Salvinia cucullata* and has also worked out the development of the same in detail.

P. P.

61. Hedayetullah, S. and Chakravorty, A. K.—A contribution to the knowledge of the wood-anatomy of a few Meliaceæ and Rutaceæ occurring in Bengal. *Proc. Twenty-fifth Ind. Sci. Cong., Calcutta*, Abstract, p. 139, (1938).

62. Joshi, A. C.—Evolution of the vegetative form in the Gesneriaceæ. *Current Science*, VII, No. 5, pp. 234-236, (1938).

The writer criticizes Sir Arthur W. Hill's paper on 'The monocotyledonous seedlings of certain dicotyledons, with special reference to the Gesneriaceæ'. Hill has studied certain plants of the tribe Crytandroidæ, in which one of the two cotyledons exhibits continued growth by means of a basal meristem, while the other generally aborts at an early stage of development. Here the author draws certain important conclusions about the evolution of these plants, but these are based on very slender evidence. From a comparison of three types studied by him the author concludes that the unifoliate genera and species represent the primitive conditions and the caulescent forms are derivates from ancestors which had assumed the unifoliate habit. The writer of this article points out that the distinction between the three groups is not absolute as some species of unifoliate type can become Rosulatæ and some become caulescent when growing in different favourable habitats. He also discusses Hill's views from different standpoints and comes to the conclusion that these are not based on a broad foundation of comparative morphology nor is evidence presented from any other source to support them. Hence to regard them primitive for Gesneriaceæ is quite unsound.

The present writer gives his own views regarding the course of evolution in these atypical Gesneriaceæ.

P. P.

63. Joshi, A. C.—A note on the morphology of the ovule of Rubiaceæ with special reference to cinchona and coffee. *Current Science*, VII, No. 5, pp. 236-237, (1938).

The author criticizes Houk's views regarding the structure of the Rubiaceæ ovule. Houk supports the older Lloyd's 'integument-nucellus' concept but gives no reasons for any of these conclusions. The writer of this article remarks that Houk's views are not based on any strong evidence and should be rejected.

P. P.

64. JOSHI, A. C.—A note on the morphology of the gynaecium, ovule and embryo-sac of *Psoralea Corylifolia* L. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 169–172, (1938).

The gynæcium in *Psoralea corylifolia* does not show at all the dual symmetry.

The evidence from comparative morphology is still largely in favour of interpreting the legume as equivalent to a single foliar carpel.

The single-ovuled condition of the carpel in this species has resulted by reduction from a more-ovuled state.

The peculiar half-ana-amphitropous form of the ovule may be regarded to have originated as a result of reduction in the number of ovules in the carpel.

After fertilization, as the embryo is developing, the ovule becomes nearly campylotropous.

The ovule possesses a small amount of nucellus and two integuments. The mature embryo-sac shows a normal egg-apparatus, three small antipodals which persist till fertilization, and two polar nuclei which meet below the egg apparatus and ultimately fuse there.

P. P.

65. JOSHI, A. C.—Parthenocarpy in *Dodonaea viscosa*. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 97–99, (1938).

Pistils of *Dodonaea viscosa* develop into parthenocarpic fruits when pollination is prevented. Such fruits are quite similar to normal fruits except that they contain no seeds and differ slightly in the behaviour of the style and stigmas. No external stimulus is necessary for such development and it is suggested that the carpels of some flowering plants have the inherent capacity of growing to their full stature (the fruiting stage) without any regard for pollination or development of seeds.

A. C. J.

66. KAUSIK, S. B.—Studies in the Proteaceæ. II. Floral anatomy and morphology of *Macadamia ternifolia* F. Muell. *Proc. Ind. Acad. Sci.*, VIII, No. 1, Sec. B, pp. 45–62, figs. 53, (1938).

The vascular anatomy of the flower shows that the perianth in *Macadamia ternifolia* F. Muell. is the whorl of sepals, while the corolla has completely disappeared. Thus a dichalmydeous ancestry is suggested for the Proteaceæ. The adnation of the stamens to the perianth is of recent origin.

The nature of the carpel is discussed in the light of the interpretation of Hunt (1937) regarding the origin of the modern angiospermic carpel.

The structure of the anther is described. The pollen grains contain a tube nucleus and a small generative cell at the shedding stage.

The nature and development of the ovule are pointed out. The embryo-sac develops along normal lines.

Fertilization and changes in the ovule after fertilization are described. The nature of endosperm, some stages in the development of the embryo and the parts of the mature seed are dealt with. Several instances of degenerations of ovules and one instance of an abnormal ovule with two nucelli and common inner and outer integuments are recorded.

S. B. K.

67. KAUSIK, S. B.—Morphology of abnormal flowers in some Angiosperms. *New Phytologist*, XXXVII, No. 5, pp. 396–408, 5 text-figs., (1938).

In this paper a description is given of five cases of abnormalities of flowers. The abnormalities fall into two categories, viz. virescence and phyllody of the floral organs and petalody of the stamens.

Virescence and phyllody:—

1. *Tropæolum majus*. The phenomena of virescence and phyllody of the floral parts proceed regularly through a series of stages and culminate in the formation of an axial foliar shoot from the flower.

2. *Trichosanthes anguina.* The male flowers, where the petals are completely transformed into leaves, show various degrees of phyllody of the anthers, and the most complete stage is that of an extensive foliar shoot springing from the centre of the flower.

3. *Allamanda grandiflora.* With the transformation of the petals into phyllodes, the ovary is replaced by a fairly elongated axis, which bears terminally a pair of leaf-like structures, the carpels.

The most interesting abnormality was seen in the ovaries of only two flowers. In these, the axis of the abnormal ovary bears distally two carpels, which separate and tend to grow out into two leaf-like structures.

Petalody:—

4. In the abnormal flowers of the yellow variety of *Jasminum*, the sepals are fewer in number but larger in size than in the normal flowers. The ovary is perfectly normal and the only condition of abnormality is seen in the transformation of the anthers into petaloid structures.

In a solitary case of a flower showing petalody of the anthers, one of the petals contained a very small accessory flower in its axil. This accessory flower had only four petals, while the other floral organs were missing.

5. A solitary case of an abnormal ovary was accidentally discovered during an examination of the slides. The massive placenta shows here a splitting into two portions, one immediately becoming life-like while the other, after a second splitting a little later, forms a reduced placenta and a second leaf-like structure.

He has also studied the vascular anatomy of the abnormal flowers. The abnormal features of flowers described in this paper are regarded as reversions in which there is a reappearance of ancestral characters.

P. P.

68. **Mahabale, T. S.**—Some observations on the structure of adhesive discs in climbing plants. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 147, (1938).

69. **Mahabale, T. S.**—The prothallus of *Equisetum debile* Roxb., var. *pashan*, Poona. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 135, (1938).

70. **Majumdar, G. P.**—A preliminary note on polystely in *Limnanthemum cristatum* and *Ottelia alismoides*. *Current Science*, VI, No. 8, pp. 383–385, (1938).

Polystely in *Limnanthemum cristatum* occurs in the cortical region of the stolons and in the petioles of the leaves arising on the stolons.

All the bundles of the peduncle and the leaf-stalk of *Ottelia alismoides* are individual steles.

The cortical steles of *Limnanthemum* have each an endodermis surrounding it without a clearly distinguishable pericycle, while the steles of *Ottelia* have both endodermis and pericycle surrounding each of them.

The author discusses various views regarding the point—whether these discrete vascular bundles would be called steles.

He comes to the conclusion that these bundle-steles, or the polystelic condition found in the otherwise normal plants owes its origin to the greater need of transport of food materials and in response to renewed terrestrial habit as Scott and others pointed out. Or the term 'Stele' may be retained only for the vascular system occupying the centre of the stem, and others may be regarded as vascular bundles with a parenchymatous sheath secondarily used as a temporary store-house for starch.

P. P.

71. **Mehra, P. N.**—Some abnormalities in the female strobilus of *Ginkgo biloba* L. *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 211–217, figs. 3, (1938).

Some abnormalities in the female strobilus of *Ginkgo biloba* are recorded from the only tree growing in the Punjab plain.

2-Ovulate normal strobili are rather rare while 3-ovulate strobili with only the terminal ovule fertile are very common on the tree. Occasionally 4-ovulate and 5-ovulate strobili are met with.

'Double ovules' formed by the fusion of the primordia of two ovules during development are met with to the extent of 20 per cent. These are flat, with a median groove. In vertical section they possess two loculi both of which may have fully developed gametophyte or only one of them. In the former case the ovules are symmetrical, in the latter asymmetrical.

Abnormal ovules having the female gametophyte exposed at the apex are frequently met with.

Anatomy of the axis of abnormal strobili has been worked out and differences from that described by previous authors pointed out.

P. N. M.

72. MEHRA, P. N.—Abnormal sporocarps in *Marsilea minuta* Linn. *Proc. Ind. Acad. Sci.*, VIII, No. 1, Sec. B, pp. 8–10, (1938).

The author has found the abnormal sporocarps in plants growing in rather dry localities and also in plants submerged under shallow water. In the former case the sporocarps are rather small in size and contain the abnormal sporangia. In the latter, however, the sporocarps externally are of the normal size and form like the typical sporocarps but they contain mostly the abnormal sporangia.

In the abnormal material the megasporangia or microsporangia of the normal type are absolutely lacking in the sporocarp. In the sporangia 16 fairly large irregularly angled spores are found which apparently seem to be non-functional. In these cases the spore-mother cells have been directly transformed into these structures. In other sporangia 16 such large spores are observed and besides a few other comparatively smaller spore-like bodies with thick walls.

In still other cases there may be no large spores formed directly from the mother cells but a number of smaller spore-like structures of different sizes with thick walls.

There is another interesting fact. A plant bears either all the normal type of sporocarps with typical mega- and microsporangia or all the abnormal sporocarps with abnormal sporangia.

The question as to what determines the formation of abnormal types of sporocarps may yet be considered undecided but the data so far collected seems to suggest the disturbance in the genetic constitution of the plants.

P. P.

73. MISRA, K. C.—Vascular supply of the pedicel and the ovule in species of Dilleniaceæ. *Nature*, CXLI, No. 3561, p. 204, 2 figs., (1938).

The study by K. C. Misra of the floral anatomy of *Wormia triquetra*, *W. Burnidgei* and *Dillenia indica*, three members of the Dilleniaceæ, has brought to light two very unusual features. First, the flower stalk contains several conducting strands, and secondly, the ovular trace branches repeatedly within the ovule.

P. P.

74. MURDIA, M. S.—Cytological studies of certain members of the Family Saprolegniaceæ. Part I. *Journ. Ind. Bot. Soc.*, XVII, Nos. 5 and 6, pp. 301–319, (1938).

An account of the cytological studies of the vegetative mycelium of the following five members of the family Saprolegniaceæ has been given: *Achlya dubia, Pythiopsis intermedia, Aphanomyces camptostylus, Aphanomyces cladogamus* and *Thraustotheca clavata.*

Observations on the living material were made both with and without vital staining. When no stain was used, there were observed in the hyphæ fat particles, mitochondria, which were filamentous in *A. dubia* and *T. clavata,* and both filamentous and granular in others, nuclei in *A. dubia* and *T. clavata* and vacuoles at the hyphal tips of all the forms. Mitochondria were stained supravitally with janus green Höcht B and dahlia violet, but both of them were very toxic and stained the mitochondria in phases preceding the death of the hyphæ. A number of vacuolar vital dyes were employed to colour the vacuolar system both supravitally and intravitally. Neutral red was found to be the least toxic and a most satisfactory dye for this purpose. No *metachromatic corpuscles* have been found in these fungi.

In each case the mycelium was fixed in a number of mitochondrical fixatives. Helly's liquid was found to be most satisfactory. The structure of the mitochondria in fixed preparations was as observed in the living condition of the hyphæ. Acetic acid and alcohol did not destroy the mitochondria in any of these fungi.

A number of nuclear fixatives were used to fix the nuclei. Iron-alum hæmatoxylin was employed to stain them. Saksena's osmic fixative gave good results in the two species of *Aphanomyces* while Merkel's with acetic acid proved quite successful for *A. dubia* and *T. clavata.* The structure of the nuclei was observed and found to correspond to that described by Saksena for the genus *Pythium.* No mitotic division was observed. Amitotic division has been occasionally found.

M. S. M.

75. RAMANATHAN, K. R.—Observations on the morphology, cytology, and development of a South Indian *Pithophora. Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 134, (1938).

76. RAO, L. NARAYANA—A case of triple parasitism. *Loranthus* vs. *Viscum* vs. *Viscum. Current Science,* VII, No. 3, p. 112, (1938).

An interesting case of double parasitism was noticed in which *Loranthus longiflorus* Desv., acting both as a partial parasite and a host, was found on *Shorea talura* Roxb.

Loranthus longiflorus Desv. has been found to be attacked by *Viscum ramosissimus* Wall. Thus the host parasite relationship in this case appears to be the only instance on record.

A further interesting stage in this relationship or association has been observed, where not only the *Loranthus longiflorus* Desv. acts both as a semi-parasite and a host but also *Viscum ramosissimus* Wall.

In its turn *Viscum ramosissimus* grows on *Loranthus* parasitically and at the same time it allows a number of its own seeds or those of other *Viscum* plants to germinate on its body so that some of them at least might establish themselves as full-grown parasites.

P. P.

77. RAO, L. NARAYANA—Flowering branches from the curd of *Brassica oleraceae* Linn. var. *botrytis* DC. *Current Science,* VII, No. 5, pp. 237–238, (1938).

The author reports the development of flowers from the curd of cauliflower. The curd of cauliflower usually breaks up after its full formation and a number of its branches shoot up bearing bract-like leaves all along and a terminal cluster of normal flowers. Hence the curd is evidently an intermediate stage between the vegetative and the reproductive phases in the life-history of the cauliflower.

P. P.

78. SARBADHIKARI, P. C.—Aposporous porthalli in *Osmunda javanica* Bl. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 133, (1938).

79. THIRUMALACHAR, M. J.—On the morphology, cytology and parasitism of *Uromyces Hobsoni* Vize. (*U. Cunninghamianus* Barc). A preliminary note. *Journ. Ind. Bot. Soc.,* XVII, Nos. 5 and 6, pp. 295–299, (1938).

In a detailed study of the spore forms by the writer various interesting features in the life-cycle were met with, which have not been recorded in rusts in general.

The autoecious nature of the rust is evident from the fact that all the three soriforms, viz., pycnidia, æcidia and telia are found on the same plant, *Jasminum grandiflorum.* Uredospores are absent.

In many of the sections through pycnidia an unusual phenomenon was noticed. From the basal part of the mature pycnocarp æcidio-spores and teleutospores were seen to develop. It is considered that this development is made possible on account of the binucleate condition of the basal cells of the pycnidium, obviating diplodization.

P. P.

80. **VENKATARAYAN, S. V.**—Coffee black bean. *Current Science*, VII, No. 3, pp. 113-114, (1938).

The author remarks that black bean in coffee is associated with the absence of the embryo.

The blackening is probably only a change that takes place in the endosperm due to the non-development of the embryo.

The possibility is that pollination or fertilization has not taken place. Due to the absence of pollen or due to its incompatibility, the fruit may develop parthenogenetically.

Hybridization has been known to lead to parthenogenesis, and it is possible that many of the coffee plants, which might be only natural hybrids, develop some of their fruits parthenogenetically.

P. P.

81. **VIJAYARAGHAVAN, C.** and **RAO, V. PANDURANGA**—The occurrence of root-hairs on aerial roots in *Sorghum*. *Current Science*, VII, No. 1, p. 20, (1938).

Due to deficient rainfall the aerial adventitious roots arising from the bottom nodes have innumerable, transparent root-hairs jutting from the epidermis. Normally in the *Sorghum* plant, the aerial adventitious roots are devoid of root-hairs. The only logical explanation for the occurrence of root-hairs on the surface of these aerial roots seems to be that they are developed there in response to the dew.

This unusual development of root-hairs strongly suggests the extreme efforts on the part of the plant at obtaining water which it so badly needed during this particularly dry season.

P. P.

EMBRYOLOGY.

82. **AHMAD, S.**—A study of *Aitchisoniella himalayensis* Kash. *Proc. Ind. Acad. Sci.*, VII, No. 4, Sec. B, pp. 206–224, 8 figs., (1938).

The genus *Aitchisoniella* is monotypic and occurs only in India. It is monoecious.

The growth of the thallus takes place by means of a single apical cell which cuts off segments on all the four sides.

Air-chambers are empty, in one layer, and directed forwards. Their origin is schizogenous.

The development of the antheridium follows the usual Marchantiaceous type. Vertical wall formation begins after a filament of four cells is produced.

The female receptacle may be terminal, lateral, or in the fork between the two lobes. It bears normally one or two involucres, but plants are found bearing three or four involucres.

In the female receptacle there is a dorsal layer of air-chambers, which are obliquely directed forwards and open to the outside by means of simple pores. Their origin is schizogenous as in the thallus.

The first division of the fertilized egg may be transverse or oblique.

A filamentous embryo results by the formation of transverse divisions both in the epibasal and the hypobasal cells. This is followed by vertical walls in all the four cells.

At the apex of the young capsule a triangular cell is cut off, but its functioning as a true apical cell is not definitely known.

S. A.

83. **BANERJI, I.**—A contribution to the morphology of *Carthamus tinctorius*, Linn. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 139, (1938).

84. **BHATIA, G. S.**—Cytology and genetics of some Indian wheats. II. The cytology of some Indian wheats. *Annals of Botany*, II, No. 6, pp. 335–371, pls. xiii–xv, 2 text-figs., (1938).

The cytology of the following wheats from the Department of Agriculture, C.P. and Berar (India) is dealt with:—

(*a*) *Triticum dicoccum* var. *Indicum*, popularly known as 'Khapli C.P.'

(*b*) *T. vulgare* var. *albidum* Al. departmental wheat AO88, and popularly known as 'Mudya'.
(*c*) A112, A113, and A115, the three sister strains of the hybrid between (*a*) and (*b*). Popularly they are known as 'Sherbati hybrids'.

The morphology of the metaphysic chromosomes in somatic mitosis has been studied. *T. dicoccum* has two pairs of satellited chromosomes, one of the pairs being tandem satellited. Of the remaining twelve pairs, eleven have one constriction each, whereas the twelfth has two constrictions. The chromosome set of *T. dicoccum* is made up of two different sets, A and B, based on the morphology of their chromosomes.

T. vulgare has three pairs of satellited chromosomes, one of the pairs being tandem satellited. Of the rest there are 12 pairs with only one constriction, whereas three pairs have two constrictions and the remaining three pairs have three constrictions each. From the morphology of chromosomes in *T. vulgare* it is evident that no two pairs of chromosomes are identical, and that the forty-two chromosomes represent three different sets, A, B and C. Further investigation of the chromosome morphology of wheat and allied genera will lead to a better understanding of the origin of *T. vulgare*.

From the morphology of the chromosomes of 'Sherbati hybrids' which are hexaploid and are about in their twenty-third generation, it is concluded that shuffling of the parental chromosomes has taken place. They also show six satellited chromosomes, one of the pair being tandem satellited.

From the measurements of the single and compound nucleoli in the leptotene stage, it is concluded that the mean total nucleolar volume is greatest when there is a single (compound) nucleolus, and diminishes progressively when two, three, or four separate nucleoli are present. The difference in size and in staining capacity between the nucleoli of one cell may result from their belonging to separate genomes.

Four leptotene threads in tetraploid and six in hexaploid wheats are attached at separate points to the compound nucleolus formed by the fusion of smaller nucleoli. In tetraploid wheat the four separate leptotene threads were also observed attached separately to each of the four nucleoli.

From diplotene onwards to diakinesis, one of the bivalents attached to the nucleolus both in tetraploid and hexaploid wheats is normally connected by a long and very fine thread to the satellite which remains attached to the nucleolus. At metaphase the satellites become merged with the body of the chromosomes. No chromosomes were seen in the chromosomes of wheats, which are always spirally coiled in structure.

The maximum number of nucleoli in the nucleus of *T. vulgare* is six, four big and two small, and in *T. dicoccum* four, two big and two small, both in root-tip cells and pollen mother-cells. The nucleoli are granulated and vacuolated in all stages, and vacuolation is considered to be a normal feature of the nucleoli of wheats.

Definite nucleoli arise in the interkinesis stage in content with the chromosomes, three being the maximum number in hexaploid, and two in tetraploid wheats. In the tetrad stage the nuclei of tetraploid wheat contain a maximum of two nucleoli, and of hexaploid a maximum of three.

The occurrence of cytomyxis may be associated with the hybridity in wheat, although the probability of its being of pathological nature is not totally excluded.

The various degrees of susceptibility to rust fungi in segregates from the 'Sherbati hybrid' wheats indicate that all the chromosomes of the Khapli parent are probably carrying genes for rust resistance.

G. S. B.

85. GATES, R. R. and PATHAK, G. N.—Chromosome structure. *Nature*, CXLII, No. 3586, pp. 156-157, (1938).

Diagrams of chromosomes from the root-tip cells of the saffron during mitosis are submitted by the authors in which the double structure of the chromosomes is rendered evident by the presence of 'satellites'. The authors state that by means of a new method which stains the chromatin red and the nucleolar material green, the origin of the nucleolus from the split chromosomes can readily be followed.

P. P.

86. JOHRI, B. M.—The embryo-sac of *Limnocharis emarginata* L. *New Phytologist*, XXXVII, No. 3, pp. 279–285, 16 text-figs., (1938).

A reinvestigation of the development of the embryo-sac in *Limnocharis emarginata* shows that the previous accounts of Hall (1902) and Nitzschke (1914) are erroneous in some essential respects. According to the former author the embryo-sac is *tetrasporic* and five-nucleate, while according to the latter, it is *monosporic* and usually six-, but sometimes seven- or eight-nucleate. My observations prove that *a tetrad of megaspores is not formed* at all *and the embryo-sac is* bisporic, *arising from the lower dyad cell formed after the first* (*meiotic*) *division of the megaspore mother cell.* A true wall cell is not cut off, though Hall as well as Nitzschke have reported its presence. The nucleus of the lower dyad cell divides to produce the primary chalazal and the primary micropylar nuclei. As a rule, the former degenerates very early and is cut off by a plasma membrane from the rest of the embryo-sac. The primary micropylar nucleus divides twice and produces the egg-apparatus and the upper polar nucleus. Thus, the mature embryo-sac is five-nucleate, but occasionally the primary chalazal nucleus may divide or fragment, resulting in six-, seven- or even eight-nucleate embryo-sacs.

B. M. J.

87. JOSHI, A. C.—The origin of different forms of ovules in the Angiosperms. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 135, (1938).

88. JOSHI, A. C.—The nature of the ovular stalk in Polygonaceae and some related families. *Annals Bot.*, II, No. 5, pp. 957–959, 2 text-figs., (1938).

The author criticizes the views recently expressed by R. A. Laubengayer regarding the nature of the ovular stalk in Polygonaceae.

Laubengayer believes that the single-ovuled gynaecium of this family has been derived by reduction from a many-ovuled condition with free central placentation, and the stalk of the ovule represents a reduced free central placenta; because its vascular supply is comparatively large and the vascular elements are so arranged as to suggest not a single morphological trace, but a product of fusion of the ventral traces of the gynaecium and the ovular traces.

To support his arguments the author draws a comparison of two plants—*Celosia argentea* Linn. representative of forms with many ovules and *Pupalia lappacea* Juss. representative of uni-ovulate forms—both belonging to a related family, Amarantaceae, and shows that the stalk of the ovule in the many-ovuled forms is as well developed as in the one-ovuled types. It is therefore of the same nature in the two cases. It is a funiculus and not a reduced free central placenta except perhaps at the basal extremity.

P. P.

89. KAJALE, L. B.—Embryo and seed development in the Nyctaginaceae. I. Studies in the Genus *Boerhaavia*. *Journ. Ind. Bot. Soc.*, XVII, No. 4, pp. 243–254, (1938).

The paper deals with the embryo and seed development in *Boerhaavia diffusa* and *Boerhaavia repanda.*

The first division of the egg is by a transverse wall to form a basal and apical cell. The former then divides repeatedly to make the embryo five cells long. Simultaneously with these transverse divisions progressing in the basal cell longitudinal walls begin to appear in the proembryo. The first appears in the apical cell, next in the penultimate cell and finally in the third cell from the apex. These three cells along with a fourth cell adjacent to the third give rise to the embryo proper. The apical cell gives rise to the plumule and the cotyledons. The second and third form the hypocotyl and the greater part of the radicle while the fourth cell is the hypophysis and completes the root apex.

The differentiation of the three histogenic layers is very peculiar. The periblem is cut off from the dermatogen and is not a sister layer of the plerome as in other Angiosperms.

The suspensor develops from the micropylar cell of the proembryo, after it has cut off the hypophysis cell. It is long and slender in *Boerhaavia diffusa* and shôrt and massive in *Boerhaavia repanda.*

A case of polyembryony resulting from the development of an extra embryo from a synergid has been observed in *Boerhaavia repanda.*

The endosperm becomes cellular only in the micropylar region of the embryo-sac.

The testa and pericarp fuse together in the mature seed.

Other features of the seed are of the usual Centrospermalean type. The structure of the perianth is described in the body of the paper.

L. B. K.

90. **Kausik, S. B.**—Studies in the Proteaceae. 1. Cytology and floral morphology of *Grevillea robusta* Cunn. *Annals of Botany*, II, No. 8, pp. 899–910, 26 text-figs., (1938).

A detailed account of the cytology and floral morphology of *Grevillea robusta* Cunn. is given.

The meiosis in the nuclei of the microspore mother-cells has been followed in detail and the haploid number of chromosomes reported by Brough (1933) has been confirmed.

The formation of a peculiar coenocytic tubular structure at the lower end of the endosperm and designated the *vermiform appendage* is described at length. In addition, attention is also drawn in the paper to the marginal absorbing cells of the endosperm as processes invading the nucellus. These structural features of the endosperm have not been previously reported, either in this or any other plant.

Several aspects of the life-history have been discussed with special reference to the earlier work of Brough (1933) on *Grevillea robusta*.

S. B. K.

91. **Kausik, S. B.**—Gametogenesis and embryogeny in *Lobelia nicotianaefolia* Heyne. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 161–168, (1938).

1. The salient features in the life-history of *Lobelia nicotianaefolia* Heyne. are described.
2. The important stages in the meiosis of the microspore mother cells are followed and the haploid number of chromosomes is recorded to be fourteen for the species.
3. The different stages in the development of the embryo-sac, the presence of an antipodal process of the embryo-sac for the absorption of nutrition and the formation of the haustoria after fertilization are discussed.
4. The development of the embryo is studied in detail and the relation of the body regions of the embryo to the primary embryonal cells is traced.

S. B. K.

92. **Kausik, S. B.**—The endosperm in *Grevillea robusta* Cunn. *Current Science*, VI, No. 7, pp. 332-333, (1938).

Brough (1933) gives an exhaustive account in a study of *Grevillea robusta*. The present observations are either at variance with those of Brough's or have been omitted by him. The tip of the nucellus fits almost intact into the micropyle as a conical projection. The endosperm is also broken down by the embryo at the region of the micropyle and when the nucellar tip is disorganized the embryo becomes lodged in the micropyle. The lowermost region of the endosperm remains coenocytic growing as a large *vermiform appendage*. This penetrates the base of the nucellus breaking down the cells. The marginal cells at the base of the endosperm grow as processes attacking the cells of the nucellus all along the sides of the embryo-sac and a cavity is formed all round the embryo-sac and the nucellus persists as a very thin layer within the integument. The change in the shape of the embryo is not attained and the absence of a suspensor is confirmed.

P. P.

93. **Lakshminarasimha Murthy, K.**—Gametogenesis and embryogeny in some Commelinaceae. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 101–116, (1938).

(*a*) *Cyanotis Cristata* Schlt.

1. There is a single hypodermal archesporial cell which functions directly as the megaspore mother cell.
2. The chalazal megaspore develops into the eight-nucleate embryo-sac.
3. The embryo-sac is restricted to an upper dome-like portion of the ovule formed by a circular constriction, the micropylar collar.
4. After fertilization, the antipodal end of the embryo-sac elongates and enters considerably down into the nucellar tissue.

(*b*) ***Aneilema spiratum*** R.Br.

1. There is a single archesporial cell which cuts off a parietal cell. The latter divides into two by a vertical wall.
2. A T-shaped tetrad of megaspores is formed.
3. The embryo-sac is normal.

(*c*) ***Zebrina pendula*** Schn.

1. Only one parietal cell is cut off by the single hypodermal archesporial cell.
2. The chalazal megaspore forms the embryo-sac.

K. L. M.

94. MEHRA, P. N.—A study of the chromosome number in some Indian members of the Family Codoniaceae. *Proc. Ind. Acad. Sci.*, VIII, No. 1, Sec. B, pp. 1–7, (1938).

The chromosome numbers in three Indian species of *Fossombronia himalayensis* Kash., *Petalophyllum indicum* Kash. and *Sewardiella tuberifera* Kash. have been investigated. The diploid chromosome number in each case is 18 but the morphology of the chromosomes in each species is different from the other.

The basic chromosome number in the family Codoniaceae appears to be 9.

Polyploidy is of rather rare occurrence in the evolution of new species in the family.

P. N. M.

95. MEHRA, P. N.—Apogamy in *Adiantum lunulatum* Burm. Part I. (Morphological). *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 192–201, (1938).

The development of the gametophyte may be regarded as intermediate between the normal type and *Pteris longifolia* type.

A cushion develops rather early in the history of the gametophyte in the axial region.

A new cushion is formed behind the apical meristem which may or may not become continuous with the old cushion.

An important characteristic of the species is the presence of fully developed tracheids in the gametophyte as a normal feature.

Gametophytes grown submerged in water from the early stages become elongated and strap-shaped and do not form any cushion. In these gametophytes tracheids are never formed. It is, therefore, obvious that the gametophyte of *Adiantum lunulatum* possesses the potentiality of forming vascular tissue under normal circumstances, under subaerial conditions and not under water.

Antheridia appear on very young prothalli. The spermatozoids are quite normal in appearance and apparently quite capable of performing fertilization. The appearance of archegonia is variable in the cultures from two different localities. The culture from Sikkim spores did not show any trace of archegonia on any prothallus. In the other culture from Kulu spores a number of archegonia appeared in the cushion region of all the prothalli on the under surface.

The embryo formation in the species takes place invariably in the form of apogamous bud. In Sikkim culture the complete elimination of archegonia rules out the possibility of any sexually developed embryo. Even in Kulu culture the archegonia play no rôle in the formation of the embryo but shrivel off.

An important feature to note is that *each cell of the embryonal tissue contains a single nucleus and at no stage* is *any irregular doubling of the nuclei observed in the cells of the embryonal tissue.*

An interesting feature is that the first leaf may be simple or compound.

P. P.

96. MEHRA, P. N.—The germination of pollen grains in artificial cultures in *Ephedra foliata* Boiss. and *Ephedra gerardiana* Wall. *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 218–230, figs. 3, (1938).

The pollen grain at the time of dispersal consists of a stalk nucleus on one end at the periphery of a central naked body cell and a tube nucleus on the opposite end in both *Ephedra foliata* and *Ephedra gerardiana*. Sometimes remains of two vegetative cells are observed on the stalk nucleus end of the grain.

Germination of the pollen grains has been brought about in artificial cultures on the natural mucilage secretion that oozes out of the mature ovules and on various strengths of saccharose solution. The germination is most vigorous on the mucilage secretion and progressively less so in 40% and 30% saccharose while practically no germination occurs in 20% and 10% saccharose solutions.

The germination of the pollen grain of either species occurs in the mucilage secretion of the other species with the same vigour as on its own.

The tube nucleus end of the spindle gametophyte is invariably the foremost during its liberation from the inside of the pollen coat.

The mitotic division of the body nucleus to form the two male nuclei invariably occurs within the spindle gametophyte before the emergence of the pollen tube. The entire process takes about 5 hours in the natural mucilage secretion.

There is no definite place for the emergence of the pollen tube from the pollen grain although usually it is given out laterally from near the tube nucleus end of the grain. Very commonly a number of tubes, as many as six, may begin emerging from a grain from all sides, some of which may branch, but ultimately only one develops further and the contents pass into this.

The two male nuclei in *E. foliata* are equal in size while in *E. gerardiana* they are invariably unequal.

Pollen tubes growing in mucilage secretion for about 48 hours attain a length of 600μ–700μ when the male gametes become senile and sometimes fragment.

In abnormal cases in both *E. foliata* and *E. gerardiana* failure in the division of the body nucleus causes it to be directly transformed to a single 'male gamete', whose functional nature is problematic.

P. N. M.

97. Mehra, P. N.—Apogamy in *Pteris biaurita* Linn. *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 202–210, figs. 6, (1938).

The development of the gametophyte in *Pteris biaurita* is of the *Pteris longifolia* type.

There is no typical cushion which is met with commonly in ferns behind the notch in well-developed prothalli.

Antheridia with motile sperms apparently capable of fertilization are formed but archegonia are eliminated out of the life-cycle of the gametophyte.

The dehiscence of the antheridia occurs by the bodily lifting of the opercular cell which is thrown off with some force.

The embryo formation is by apogamous bud.

P. N. M.

98. Nandi, H. K.—Structure of the meiotic chromosomes of *Hosta Sieboldiana* Hosk. *Proc. Twenty-fifth Ind. Sci. Congr.*, *Calcutta*, Abstract, p. 141, (1938).

99. Nandi, H. K.—Cytogenetical studies on jute. *Proc. Twenty-fifth Ind. Sci. Congr.*, *Calcutta*, Abstract, p. 142, (1938).

100. Narasimhachar, S. G.—Megasporogenesis and female gametophyte in *Malpighia punicifolia* Linn. *Current Science*, VI, No. 10, pp. 507–509, figs. 5, (1938).

The author remarks that the megaspore mother cell develops into a Lilium-type of embryo-sac without the intervention of a linear tetrad. In the later stage the embryo-sac contains four groups of four nuclei. One nucleus from each of these groups migrates to the centre to form a four nucleate-fusion nucleus. Then the four groups of nuclei degenerate. The author points out that *Malpighia punicifolia* does not show any polyembryony.

P. P.

101. Patel, J. S. and Narayana, G. V.—Chromosome numbers in some economic flowering plants. *Current Science*, VI, No. 10, pp. 509–510, (1938).

The $2n$ numbers of chromosomes in *Arachis hypogoea* Wild., *Moringa oleifera* Lamk., *Coriandrum Sativum* Linn. and *Vetiveria zizanoides* Nash. are 40, 28, 22 and 30 respectively.

P. P.

102. **Puri**, V.—The embryo-sac and embryo of *Temarix chinensis* Lour. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 138, (1938).

103. **Raghavan**, T. S.—Morphological and cytological studies in the Capparidaceae. II. Floral morphology and cytology of *Gynandropsis pentaphylla* DC. *Annals of Botany*, II, No. 5, pp. 75–95, 1 pl., 57 text-figs., (1938).

The diploid chromosome number of *Gynandropsis pentaphylla* is thirty-four and the haploid seventeen.

The origin and behaviour of the megaspore is essentially the same as described for *Cleome Chelidonii*. The linear tetrad, which is the most commonly prevalent condition, is not held to be of any phylogenetic significance.

The origin and behaviour of the tapetum in the anther-sac is described. It is differentiated from the innermost wall layer and becomes binucleate early. The nuclei divide again and the resulting four nuclei fuse. Different cells of the same tapetal layer show different stages of division and fusion of their nuclei.

The pollen grains are binucleate at the time of shedding. The generative nucleus is surrounded by specialized cytoplasm with a thin membrane to form a lenticular cell.

Secondary association in stages of meiosis has been recorded and the basic number, based on maximum association, is found to be seven.

The behaviour of the nucleolus is described and two satellited chromosomes are found to be responsible for the organization of the nucleolus in the monoploid cell. From both secondary association and nucleolar behaviour, it is concluded that the plant is a secondarily balanced allotetraploid.

T. S. R.

104. **Ramanujam**, S.—Cytogenetical studies in the Oryzeae. I. Chromosome studies in the Oryzeae. *Annals of Botany*, II, No. 5, pp. 107–125, pl. ii, 31 text-figs., (1938).

Chromosome studies, with a view to ascertaining taxonomical relationships in the tribe, were undertaken for the first time and results from several species in five genera lead to the following conclusions.

The basic number of chromosomes for the tribe is five and not twelve, as was supposed by Avdulov.

While one section, the Zizaniinae, retained the original basic number and developed a polyploid series, the other section developed a secondary basic number twelve, through secondary polyploidy and built up a polyploid series on this new number. Thus the taxonomical classification of the tribe into two sections is supported by cytological observations.

It is suggested that *Lygeum* with large chromosomes and different habitat, with $2n = 40$ chromosomes, be placed in a third section.

A brief discussion regarding species differentiation in the tribe and thier position in the family is included.

S. R.

105. **Rao**, V. S.—Studies on Capparidaceae—III. Genus *Capparis*. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 69–80, (1938).

C. galeata.

(1) The development of the embryo-sac is normal, and in mature synergids a filiform apparatus is found.

(2) In the development of the embryo, some of the suspensor cells also divide and contribute to the formation of the embryonal sphere of cells.

(3) The mature ovule is campylotropous, but the orthotropous condition is found as an abnormality. Other interesting abnormalities are also found.

C. sepiaria.

(1) The development of the embryo-sac is similar in essentials to that of *C. galeata.*

(2) In an abnormality, the integuments end far below the tip of the nucellus,

C. horrida.

The development is similar to *C. sepiaria.* Degenerations in the embryo-sacs abound in all the species, and starch is found in the degenerating cells.

V. S. R.

106. Rao, V. S.—The correlation between embryo type and endosperm type. *Annals Bot.*, II, No. 5, pp. 535–536, (1938).

The author has pointed out a striking correlation between type of embryo and of endosperm. In those plants in which from the beginning the embryo grows very rapidly and is early differentiated, the endosperm developed in the embryo-sac is almost always non-cellular, cell formation taking place only very late. On the other hand, if the growth of the embryo is very slow or if the ripe seed contains only an undifferentiated embryo, then the endosperm is cellular either from the very beginning, or cell formation takes place very early.

He has quoted some examples taken from published papers.

P. P.

107. Sharma, Y. M. Lakshminarayana—A note on gametogenesis in a few members of Sterculiaceae. *Current Science*, VII, No. 6, pp. 284–285, figs. 5, (1938).

The author gives a short account on the gametogenesis of a few members of the family.

The ovules have two integuments in all, and in *Helicteres isora* the nucellus is exposed due to the incomplete development of the two integuments.

The usual course of development follows and the normal eight-nucleate embryo-sac is formed.

In *Pterospermum acerifolium* the multiple tetrads develop into double and triple embryo-sacs.

Meiosis in the microspore mother cells of *Sterculia acerifolia* and *Pterospermum reticulatum* has been studied and the haploid chromosome number in both is nineteen.

P. P.

108. Subba Rao, M. K.—Chromosomes in *Camellia thea* (the tea plant). *Current Science*, VI, No. 9, p. 457, (1938).

The haploid number of chromosomes in some Chinese *jats* such as *Camellia sinensis* has been found as fifteen ($x = 15$) by previous workers. Chromosome numbers counted in the four *jats*, South Indian seed (A), Bonaccord, Chapleton, and China (?) were found as thirty ($2x = 30$) for the first one and fifteen ($x = 15$) for the rest; this confirmed the numbers recorded by the earlier workers.

P. P.

109. Wulff, H. D. and Maheshwari, P.—The male gametophyte of Angiosperms. A critical review. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 117–140, (1938).

Generally, four functional microspores are formed by reduction division of the pollen mother cell. The nucleus of the young microspore after a typical resting period divides into the tube cell and a smaller generative cell, their position being influenced by the mode of quadripartition of the pollen mother cell and the germ-pore. The generative nucleus is more stainable but its plasm has a lack of staining capacity and includes in different cases chloroplasts, plastids, minute chromatin bodies and even mitochondria. The occurrence of centrosomes in the male gametophyte is disputable. The pollen grains are shed at a 2- or 3-celled stage. Schürhoff holds that 2-celled pollen grains are found in more primitive families and 3-celled in more advanced ones. *Poddulenaja arnoldi* differs from this as it succeeded in varying the number of nuclei from 2 to 3 by altering the external conditions. Large embryo-sac like pollen grains have also been found with 8, 4 or 16 nuclei, showing some real female tendencies of a physiological nature.

The division of the generative cell is normal when the pollen tube is comparatively broad but when it is narrow a 'pseudo-equatorial plate' is formed instead of a regular metaphase and spindle fibres are absent. A restitution nucleus is even formed when chromosomes fail to pass to the poles. The generative cell is more active and it moves from its original position near the wall of the pollen grain towards its interior into the vegetative cytoplasm. The generative cell and later male gametes are said to move in the tube by the streaming of the plasma but workers have shown recently that their movement is due to their own motility. The movement of the male gametes inside the embryo-sac is also due to their motility as can be studied from their curved 'worm-like' appearance in some cases. The vegetative nucleus stains less deeply and it is supposed to degenerate and has probably no significance for the growth of the pollen tube. Division of the vegetative nucleus has, however, been recorded in several plants. The sperm cell (or nuclei) are generally round or oval but filamentous and spirally curved ones are also met with at least in Compositae. Although the sperms are organized as definite cells when they are discharged into the embryo-sac yet the actual entrance of the male plasm into the egg has not yet been cytologically demonstrated. In some cases the sperm cells from a single pollen tube have been found different in size, shape and chromoticity.

The 2 or 3-celled pollen grains, the presence of a cytoplasmic sheath round the generative nucleus and later the male nuclei, and their general shape and a repeatedly branched pollen tube, provide clues for taxonomic evaluation at least in narrow circles of affinity.

P. P.

PHYSIOLOGY.

110. BAL, N. L.—The effect of light on lipase activity. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 148, 1938.

111. BAMJI, N. S.—The ammoniacal, nitrate and total nitrogen contents of rice soils. *Ind. Journ. Agric. Sci.*, VIII, Part VI, pp. 839–847, (1938).

The total nitrogen content of the rice soils varies from 1,000 to 1,820 parts per million; the ammoniacal nitrogen varies from 17 to 59 parts per million, and the nitrate nitrogen varies from 2 to 7 parts per million.

Under field conditions the addition of fertilizers have not shown any increase in the inorganic nitrogen when these soils were analyzed, probably due to wider fluctuations in the inorganic nitrogen contents that occur in natural soils, and thus the small increases are obscured by them.

The ammoniacal nitrogen is higher than nitrate nitrogen. It may be due to the rice soils being acidic, for ammoniacal nitrogen is known to accumulate in the acid soils. It may also be due to the conditions in rice soils not favourable to nitrification or favourable to ammonification.

No relationship exists between nitrate nitrogen and organic nitrogen, but the ratios between ammoniacal nitrogen and organic nitrogen are more or less constant, supporting the well-established facts about the processes that lead to the production of ammonia in the soil.

N. S. B.

112. BOSE, S. R.—The effect of radiation on some Polypores in culture. *Journ. Ind. Bot. Soc.*, XVII, No. 1, pp. 5–68, (1938).

The radiation here refers to treatment of malt-extract agar-plate-cultures of three Polypores (*Polyporus ostreiformis, Polystictus leoninus and Trametes cingulata*) by ultra-violet rays, X-rays, radium, and sunlight. The effects of radiation are usually manifested in either of two ways. The one is phenotypic and indirect, producing noxious physical or chemical conditions in the environment of the germ-plasm, and the other is genotypic, causing direct hits on the chromosomes in the nucleus.

After the treatment of ultra-violet and solar radiations, though in all three cases (*Polystictus leoninus, T. cingulata and Polyporus ostreiformis*) there was finally reversion to the normal state within a varying period, it was clear from results that increasing the number of exposures was more effective in causing damage both to the vegetative and reproductive phases.

The effect of exposure to direct sunlight minus ultra-violet rays but combined with higher temperature was much more pronounced than that of ultra-violet, X-rays or radium in both the vegetative and reproductive phases. The killing effect was evident after the second exposure and the cultures ultimately died, they could not be revived in subcultures; thus, the fruit formation was permanently checked.

The changes in fungi which have been described as due to the influence of visible and ultra-violet light have not been heritable. They have been in no sense mutations.

In the treatment of X-rays on Polypores also only negative result was obtained, no saltant or mutant involving genic change was ever produced.

In the case of three Polypores treated with heavy doses of radium there was retardation of the vegetative growth, damage of the vegetative hyphae, suppression of spore-formation and delayed and imperfect development of fruit-bodies, in some cases there was an increase in the number of chlamydospores. Ultimately, in subcultures (succeeding vegetative generations) recovery was noted within a varying period in all even where the radium was placed direct on the hyphae continuously for ten days, but it was usually found that recovery in the vegetative phase was quicker than in the reproductive one. Polypores, thus, seem to be extremely resistant to radium. Here no permanent change in the form of saltation or mutation could be produced.

P. P.

113. **Chakraborty, J. N.**—A method of dispersion of soils for mechanical analysis. *Ind. Journ. Agric. Sci.*, VIII, Part VI, pp. 829–837, (1938).

A method of dispersion of soils for mechanical analysis has been described. This method includes treatment of the soil with alkaline permanganate for oxidation of organic matter but is free from treatment with hydrochloric acid and may be adopted by those who do not advocate the treatment of soils with acids in course of mechanical analysis.

Results for clay and clay + silt by the above method of dispersion are quite comparable with the results by the International-A method.

The loss on solution by this method is considerably less than that by the International-A method and therefore its determination may ordinarily be omitted when the proposed method is followed.

A slightly different treatment to soils containing calcium carbonate has been suggested for mechanical analysis.

J. N. C.

114. **Chatterji, U. N.**—Studies on the effect of definite doses of alcohol on the activity of certain enzymes in the leaf of *Eugenia jambolana*. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 145, (1938).

115. **Chatterji, U. N.**—Studies on the effect of alcohol on the respiratory rate of leaves. *Proc. Nat. Acad. Sci. Ind.*, VIII, Part I, pp. 18–28, figs. 4, (1938).

Experiments were carried on with a view to find out the effect of alcohol on respiration. Definite percentages of ethyl alcohol were introduced into the leaves of *Eugenia jambolana*; the amounts of alcohol thus entering the leaves have been ascertained. The subsequent acceleration of the respiratory rate has been compared with the amount of alcohol entering the leaves. The acceleration of respiratory rate produced by alcohol decreases with time. The percentage of alcohol that brings about the maximum acceleration of the respiratory rate at the beginning does not maintain the increased production of carbon-dioxide but subsequently brings about a rapid fall. On the other hand, the alcohol solutions that produce milder stimulation maintain the enhanced respiratory rate for a much longer time.

U. N. C.

116. **Chopra, N. N.**—The rôle of nitrogen compounds in the fermentation of fruit juices. *Proc. Nat. Inst. Sci. Ind.*, IV, No. 3, pp. 289–293, (1938).

Fresh orange juice contains sufficient nitrogen in an easily assimilable form for the primary fermentation by *Saccharomyces ellipsoideus*.

'Heat sterilization' under pressure destroys most of the organic and much of the ammoniacal nitrogen compounds in sweetened orange juice, the amount lost depending upon the pressure employed and the duration of the treatment. Pure grape juice under similar conditions suffers this loss to a much less degree.

The primary fermentation is not appreciably hindered by the above loss in nitrogen compounds, but the 'after fermentation stages', namely those of film formation and oxidation, are in this case inhibited.

During fermentation the organic nitrogen content of the juice again increases, probably as a result of synthesis by the yeast of soluble organic nitrogen compounds. But these compounds do not seem to be available for the secondary changes, during the 'after-fermentation stage', induced by the life-cycle of yeast. N. N. C.

117. Das Gupta, S. N.—On the culture behaviour of a species of *Rosellinia*. II. Further experiments on the production of Perithecia. *Proc. Ind. Acad. Sci.*, VII, No. 1, Sec. B, pp. 22–35, (1938).

The present paper deals mainly with the effect of various chemicals (asparagin, KNO_3, acid, alkali and C/N ratio) on the production of perithecia in a species of *Rosellinia* and supplements the results given in a previous paper (Das Gupta, 1937). The stimulating effect of a bacterium on the formation of perithecia is briefly dealt with.

The following are the main points:—

The *number of perithecia* formed in a medium decreases with the increase in the concentration of asparagin, potassium nitrate, acid and alkali. In simple agar medium the higher the agar concentration the greater the number of perithecia formed. Innumerable perithecia appear in media combining a relatively high content of potassium nitrate with a moderate amount of glucose.

The *size of the perithecia* is only slightly reduced in media combining a relatively high concentration of asparagin and potassium nitrate with low concentrations of glucose. The size is greatly reduced in the media where KNO_3 content and glucose content are both relatively high.

Addition of glucose in a medium having a relatively high KNO_3 content has a *deleterious effect on the production of asci and ascospores.*

Development of perithecia is inhibited much before the vegetative growth of the fungus is retarded due to high concentrations of chemicals except in the cases of the acid and alkali series where the perithecia develop as long as vegetative growth is not totally checked.

Regional distribution of perithecia in different modified media is briefly dealt with.

S. N. D. G.

118. Dastur, R. H., Kanitkar, U. K. and Rao, M. S.—The formation of proteins in leaves in light of different quality. *Annals of Botany*, II, No. 8, pp. 943–953, (1938).

In continuation of the previous work on carbohydrate content of leaves (Dastur *et al*, 1933, 1935, and 1937) exposed to light of different qualities the water-soluble, organic nitrogen content of leaves of *Helianthus annuus, Ricinus communis, Abutilon asiaticum, Tropaeolum majus, Raphanus sativus,* and *Nicotiana Tabacum* have been examined.

The order of increase of the water-soluble N of the leaves in different lights of equal *total* intensity is carbon arc>'daylight' lamp>ordinary electric lamp>daylight.

If monochromatic light and daylight are compared the organic N content with low light intensity is in the order daylight>red light>blue-violet light. With high intensity, using the carbon arc, the blue-violet is more effective than the red.

The explanation is put forward that during the process of photosynthetic assimilation there is a condition of balance between protein formation and carbohydrate production. When the ratio of the intensity of red to blue-violet ray is high, as in ordinary electric light, the carbohydrate production is depressed and the formation of proteins is limited by the carbohydrate supply. When the ratio is low, as in daylight, the rate of carbohydrate production and the rate of protein formation is depressed by the accumulation of carbohydrates. With an intermediate condition, as in the light of the carbon arc, both processes go on actively, protein formation being more active than in ordinary electric light.

R. H. D., U. K. K. & M. S. R.

119. Dastur, R. H. and Mensinkai, S. V.—Isoelectric point of the proteins of the tissue of the cotton plant in relation to the *p*H of the cell sap. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 149–160, (1938).

There is an alternate increase and decrease in acidity of the sap of roots and stem taking place five times during the season. In the case of the leaves after the first increase in acidity there is a regular decrease in acidity till the last stage when the plant shows signs of drying up. A big fall in the acidity of the sap occurs during the intense flowering period.

The proteins of the tissues of the plants are on the alkaline side of the isoelectric point during the entire growing period of the plant. The proteins are positively charged. As the reaction of the sap changes during the growth, the positive charge on the proteins increases or decreases. Thus the number of protein anions and cations changes as the *p*H value changes and *vice versa*. These variations in the charge of the proteins may be responsible for the absorption of the positively and negatively charged ions as at one time proteins combine more readily with bases than the acids and at other times less readily with bases than with acids.

R. H. D. & S. V. M.

120. DASTUR, R. H. and JOHN, WINIFRED—The growth of rice seedlings in salt solutions of different H-ion concentrations. *Journ. Ind. Bot. Soc.*, XVII, No. 4, pp. 255–268, (1938).

In their studies on the intake of nitrogen Dastur and Malkani (1933) have shown that rice seedlings absorb more of ammoniacal nitrogen than the nitrate nitrogen from their respective salts. They have also determined the order of absorption of the ammonium and nitrate ions from their respective ammonium salts and nitrates and they have shown that the ammonium salts stood in the order sulphate, phosphate, nitrate and chloride as far as the absorption of ammonium ion was concerned.

Similarly, the nitrates stood in the order ammonium, potassium, magnesium, calcium and sodium.

In the above investigation the effect on the growth of the rice seedlings of the absorption of these ammonium and nitrate ions from different salts is not determined. It is necessary to determine if the greater absorption of the ammonium ion is accompanied by greater growth of the seedlings as compared with the growth of the seedlings kept in solutions of nitrates.

The effect of the hydrogen ion concentration of the salt solution on the growth of plants is well-known and it is therefore necessary to study the growth of rice seedlings in salt solutions of different *p*H values.

The *p*H value of each salt solution has great effect on the growth of the rice seedlings. The results show that in all cases the greatest growth occurred in the salt solutions whose *p*H ranged from about 6·0 to 7·0. Very little or no increase in dry weight was noticed in the salt solutions with low *p*H values indicating that acidity lower than 6·0 *p*H was detrimental to the growth of the seedlings.

The results of these experiments were statistically interpreted by using Fisher's method of analysis of variance and as a result of that the following facts emerged.

Culture with ferric phosphate was superior to culture with $FeSO_4$. Similarly, culture with ferric phosphate was superior to culture without iron. No difference was found between the culture with $FeSO_4$ and culture without iron. Culture with potassium nitrate as a source of nitrogen was found superior to culture with ammonium sulphate.

Amongst the single salt solutions ammonium sulphate and ammonium phosphate are found superior to potassium nitrate as the dry weights of the seedlings are higher in the former than in the latter. In the other nitrates and ammonium salt solutions the growth of the seedlings is poor.

In the two salt solutions those combinations which contain ammonium phosphate are found to be superior to other combinations.

The ordinary culture solution is found to be the best of all the solutions used.

Thus for the growth of the rice seedlings ammonium sulphate and ammonium phosphate are found to be better than potassium nitrate and the most favourable *p*H for the growth of the rice seedlings lies between 6·0 and 7·0, i.e., towards the neutral point.

R. H. D. & W. J.

121. DESAI, S. V. and FAZAL-UD-DIN—Denitrification in the presence of sugars (with one text-figure). *Ind. Journ. Agric. Sci.*, VIII, Part IV, pp. 447–457, (1938).

Photo-denitrification of potassium nitrate and sodium nitrate in the presence of some carbohydrates has been studied. It has been found that the reduction of potassium nitrate is not affected by the concentration of glucose present. The denitrification of sodium nitrite is much accelerated in the presence of carbohydrates, and is independent of the nature of carbohydrate used. The decomposition of nitrite is more rapid than that of nitrate. Ammonia is also formed during reduction. The oxygen of the air is not essential for bringing about denitrification. The oxidation of glucose to carbon dioxide, water and acids, and other non-saccharine substances is greater in the presence of sodium nitrite than in its absence.

S. V. D. & F. D.

122. **Ekambaram, T.** and **Kamalam, V. K.**—Permeability of the xylem vessel wall. *Proc. Twenty-fifth. Ind. Sci. Cong., Calcutta,* Abstract, p. 146, (1938).

123. **Ekambaram, T.** and **Kamalam, V. K.**—The effect of carbon dioxide on water entry into the roots. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 146, (1938).

124. **Fritsch, F. E.** and **De, P. K.**—Nitrogen fixation by blue-green algæ. *Nature,* CXLII, No. 3602, p. 878, (1938).

Prof. F. E. Fritsch and P. K. De report that pure cultures of the blue-green alga *Anaboena* found in Indian rice fields has been shown to have the property of fixing nitrogen from the air, and they claim that this is the first conclusive proof of the ability of a blue-green alga to do so.

P. P.

125. **Ghosh, L. M., Ghosh, S., Chatterjee, N. R.** and **Dutt, A. T.**—Actinomyces: Their biochemical reactions as aids in their classification. Part I. Reduction of nitrates. *Journ. Ind. Bot. Soc.,* XVII, Nos. 5 and 6, pp. 279–286, (1938).

The classification of the group of micro-organisms generally designated as Actinomyces is still very unsatisfactory and various authors have put forward different schemes of classification based on the morphology, clinical characters, physiological properties, etc. The authors have studied the biochemical property of the reduction of nitrates to nitrites and have been able to divide them into three groups. They think that further work on these lines would provide additional factors in their classification.

L. M. G., S. G., N. R. C. & A. T. D.

126. **Iyengar, A. V. Varadaraja**—Studies in the physiology of spike disease of sandal. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 146, (1938).

127. **Iyengar, A. V. Varadaraja**—Estimation of manganese in plants. *Ind. Journ. Agric. Sci.,* VIII, Part VI, pp. 819–828, (1938).

An examination has been made of the applicability of lead peroxide for the oxidation of manganese to permanganate with a view to improving this method for adoption in routine analysis.

It was found that nitric acid concentration, time of heating and, to some extent, the amount of lead peroxide used, were factors which influenced the rate of oxidation of manganese.

An easy and rapid method has been described.

The stability of the tint in presence of iron salts was tested and found to be maintained through the addition of phosphoric acid.

The improved lead peroxide method was found to compare very favourably with the periodate technique both with pure salts and with different plant parts studied.

A. V. V. I.

128. Kar, B. K.—Recent advances in the study of plant growth hormones. *Science and Culture*, IV, No. 2, pp. 84–89, (1938).

Many synthetic substances have been added to the list of growth hormones. Modified Standard Avena Test has been recommended by having a second decapitation one hour after the first. It is also suggested that a deseeded seedling gives a more sensitive test plant.

Auxin is always associated with growth, and is formed and stored in one part and is effective in another part. The terminal buds, the lateral buds, the cotyledons and leaves are amongst the most important sources of auxins in plants. The amount of auxin and its diffusion from the leaves is correlated with the age of the leaf.

Auxin always moves basipetally down the stem from the apical region even when the initial concentration at the base is higher than that of the upper part. While moving downwards it forms a concentration gradient.

The association of cambial activity and bud development suggests the possibility of the influence of hormone in cambial initiation in the spring.

The nature of auxin reaction has been recently explained by Went on a double factor scheme. He suggests independent specific factors of hormone nature, naming them different calines responsible for stem elongation, bud development and root formation and auxin playing a secondary rôle in diverting and redistributing these calines in plants. On this basis the formation of roots, the inhibition of the lateral buds by auxin and the close relation between sprouting and rooting have been explained.

It seems on the basis of our present knowledge that auxin induces a chain of reactions in a system where many internal and external factors play a part and it has been demonstrated that sugar at least is one of the necessary components of such a system.

B. K. K.

129. Khanna, K. L and Sen, S. C.—A note on the use of sub-acetate of lead in the clarification of sugarcane juice for the estimation of reducing sugars by the potassium ferricyanide method. *Ind. Journ. Agric. Sci.*, VIII, Part IV, pp. 441–446, (1938).

A method for the quick estimation of glucose in cane juice is described and it consists in the direct use of lead sub-acetate filtrate for titration of glucose with one per cent alkaline potassium ferricyanide solution.

The method qualifies that only 2 to 3 grains of lead sub-acetate should be used for clarifying each 150 c.c. of the original cane juice, as higher quantities have been found to give lower readings for glucose.

A close correspondence between the results obtained from the direct use of lead sub-acetate filtrate against potassium ferricyanide solution, and those with the usual sodium phosphate filtrate against Fehling's and ferricyanide solutions, has been demonstrated.

K. L. K. & S. C. S.

130. Khanna, K. L. and Raheja, P. C.—Preliminary studies in the respiration of sugarcane in situ. *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 253–269, 5 text-figs., (1938).

Respiration studies on eight prominent sugarcane varieties were conducted during an advancing hot weather to study the effect of increasing drought and the response to it shown by different varieties under test. The results that have emerged are mentioned below:—

During the day, respiration rate was low in the morning; it rose with the rise in temperature till the latter became supra-optimal (about 2-0 P.M.) when this rate fell considerably, the plant tending to regain its normal function with the return of favourable temperatures in the evening.

Of the varieties under test some were observed to be more consistent and less fluctuating in the periodic rate of respiration than the others. Co 213 was found to be most susceptible while Co 313 was least affected. Other varieties ranged themselves between these two extremes in the following ascending order namely, Co 299, Co 210, Co 356, Co 326, Co 331 and Co 214.

Varieties with higher concentrations of chlorophyll were observed to possess narrower range of fluctuations in their respiratory activity as compared to those with lower ones, suggesting that higher concentrations afforded greater stability to the vital processes of the plant.

In the beginning of the hot weather the two-hourly fluctuations in the respiratory activity during the day were fairly consistent but as the hot weather advanced these fluctuations became more pronounced, so much so that in the third series (23rd May to 2nd June) they were the highest recorded. With the passage of time and possibly through adaptation they narrowed down considerably later in the season.

A fair degree of correlation seemed to exist between the magnitude of depression in the respiration rate and the acknowledged drought resistance of different varieties.

K. L. K. & P. C. R.

131. KUMAR, L. S. S.—A new phanerogamic parasite of *Andropogon Sorghum* (Jowar). *Current Science*, VII, No. 1, pp. 19–20, (1938).

It is recorded for the first time that *Sopubia delphinifolia* was definitely attacking *Sorghum* by its roots establishing connection with the roots of *Sorghum*. It was also noticed by the author that a single parasite plant had its roots connected with the roots of three or four host plants.

P. P.

132. LAURIE, M. V.—Root competition and available nitrogen in the soil. *Ind. For.*, LXIV (11), pp. 652–655, (1938).

The vegetative response to removal of root competition in trenched plots was formerly explained as being chiefly due to increased available moisture in the soil. Recent work in Sweden in spruce forests suggests that increase in available nitrogen may be the chief factor, this being correlated with the killing of mycorrhizal fungi.

M. V. L.

133. PAL, B. P. and NATH, PUSHKAR—Shortening the rest period of the potato (*Solanum Tuberosum* L.). *Ind. Journ. Agric. Sci.*, VIII, Part VI, pp. 777–786, pl. lix, 4 text-figs., (1938).

Experiments were carried out to investigate the effectiveness of several treatments in shortening the rest period of potato tubers.

The most successful treatment was peeling the tubers and storing them in moist saw-dust for a week. The response to this method was the quickest and also the most uniform.

The ethylene chlorhydrin vapour method and the ethylene chlorhydrin dip method for cut tubers were also distinctly successful although the results were not quite so good as with peeling.

The fourth method tested, the ethylene chlorhydrin dip method for whole tubers, proved inferior to all the treatments except the untreated control.

It is pointed out that though at present such methods of breaking the rest period of potato tubers are unlikely to be adopted by commercial growers, they are of value to potato breeders and geneticists.

Previous studies on the subject are briefly referred to.

B. P. P. & P. N.

134. PAL, N. L.—The effect of light on respiration and conversion of fat to sugar in germinating *Helianthus* seeds. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 148, (1938).

135. RAJAGOPALAN, T.—Studies on groundnut nodule organism, I. Isolation of strains and study of cultures. *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 331–348, 1 text-fig., (1938).

Isolates of nodule organisms from six varieties of groundnut were compared morphologically and physiologically.

The isolates were alike morphologically but fell into two distinct physiological strains.

The characteristics of one strain were high gum production, high sensitivity to hydrogen-ions, high 'ferment' power, high nitrogen fixation and production, of large numbers of small and medium sized nodules which were concentrated more on the tap-root than on the laterals. The other strain showed the reverse characteristics.

The efficiency of the strains as nitrogen fixers appears to depend more on the location of the nodules than on their number and size.

T. R.

136. **Rajagopalan, T.**—Studies on groundnut nodule organism. II. Life-cycle of the organism. *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 349–355, pls. xiv–xv, (1938).

The life-cycle of a selected strain of groundnut nodule organism was studied in different media including soil under varied conditions and the different processes of reproduction observed are indicated.

The organism passed through the different stages described by Bewley and Hutchinson, Gibson and others, namely, rods, coccoids (motile and non-motile), gonidangia, gonidia and micro-cysts. The results of the observation also show that the motile cocci or the swarmers could emerge directly from the banded rods without passing through the non-motile pre-swarmer stage.

The reproduction observed in almost all the media, after the banded rod stage was attained, indicates that the so-called involution or banded rod stage represents one of the normal processes in the development of the organism.

The reproductive processes of the organism seem to take place in the main by budding, germination, liberation of gonidia and by formation of regenerative units from the symplastic stage.

Under anaerobic conditions, the banded rods were noticed in abundance in all the media and the motility was more persistent in solid media and in nutrient broth than in other cultures.

In the partial pressure cultures also, the banded rod stage was predominant throughout the entire period of observation in almost all the media tried, except nutrient broth media, solid and liquid, wherein this stage appeared and continued throughout from the sixth day onwards.

T. R.

137. **Rajagopalan, T.**—Studies on groundnut nodule organism. III. Physiology of the organism: Fermentation characteristics. *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 357–377, 3 text-figs., (1938).

The organism has been found to attack all the carbohydrates including dextrin in varied amounts, producing the same final hydrogen-ion concentration in all the cultures at the end of one month. Arranged in order of fermentation, glucose ranks foremost, followed by levulose, mannose, sucrose, raffinose, galactose, maltose, dextrin, xylose and lactose.

The studies indicate that the fermentation of glucose depends to a large extent on the concentration of the sugar, the presence of buffer salt (K_2HPO_4), peptone, nitrate, calcium carbonate, initial reaction of the medium, etc.

The ferment power of the organism (*s* : *ct* ratio, where *s* is the sugar consumed, *c* the cell weight and *t* the period of incubation) is very high during its earlier stages of growth and subsequently diminishes rapidly with the advance in age of the culture. This indicates the existence of two distinct phases in the physiology of the organism, the first stage corresponding to a period of great sugar utilization with less of cell synthesis, a period of high 'ferment power', and the second one or maintenance phase of low 'ferment power', when vigorous cell synthesis takes place.

These experiments emphasize, in short, the need for a proper control of a culture medium with reference to its composition, reaction, etc., for the fermentation of a given amount of carbohydrate to proceed normally to completion, besides revealing some of the factors retarding the fermentative activities of the organism.

T. R.

138. **Rajagopalan, T.**—Studies on groundnut nodule organism. IV. Physiology of the organism. Intermediary metabolism: Carbohydrates and nitrogen. *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 379–402, 6 text-figs., (1938).

The products detected and estimated in the fermentation of glucose Ashby's medium were: (i) acetic acid, (ii) alcohol, (iii) traces of aldehyde, (iv) lactic acid, (v) tartaric acid, besides carbon dioxide.

Most of the carbon assimilated by the organism in dextrose Ashby's nitrate medium has been accounted for. The results show that out of the total carbon in the sugar utilized by the organism, about twenty-one per cent appeared as carbon dioxide, fourteen per cent in the cells, and the balance sixty-five per cent formed the carbon of the by-products other than carbon dioxide.

The nitrogen content of the bacterial cells increases with the age of the culture with decreasing carbon-nitrogen ratios.

The enzymes tested for and detected in the bacterial cells of the organism in Ashby's mannite-agar medium were gelatinase, catalase, deaminase, carboxylase, tyrosinase, urease, oxidase and peroxidase, besides various other sugar-splitting enzymes.

There is a definite correlation observed between the amino acid produced and ammonia formed in the peptone cultures of the organism. The increase in ammonia in these cultures is generally associated with a corresponding decrease in amino acids.

In nitrate cultures, the organism attacks the nitrate without a quantitative corresponding increase in the organic or ammoniacal nitrogen at any period of analysis.

T. R.

139. **Ramdas, L. A. and Mallik, A. K.**—The exchange of moisture between air layers near the ground and substances like soils, plant leaves, seeds, etc., exposed to the atmosphere. *Current Science*, VI, No. 9, pp. 452–454, (1938).

It was shown by Ramdas and Katti that the soil has its *maximum* moisture content at the minimum temperature epoch and its *minimum* moisture content at the maximum temperature epoch.

The results summarized in this paper show that dry plant materials exchange moisture with the air layers surrounding them just as the soils do so.

P. P.

140. **Ranjan, S.**—The effect of violet and ultra-violet radiations on plant respiration. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 148, (1938).

141. **Rao, H. S.**—Cuticular studies of Magnoliales. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 153, (1938).

142. **Rao, L. Narayana**—Perennation in *Cuscuta reflexa* Roxb. *New Phytologist*, XXXVII, No. 5, pp. 474–477, 1 text-fig., (1938).

A new method of perennation of *Cuscuta* has been observed where perennation takes place by the survival of only the haustorial tissue within the host during the dry months, the parasite body completely disappearing. The haustorial tissue gives rise to a number of young shoots early in the next growing season.

L. N. R.

143. **Rao, V. Panduranga**—Effect of artificial wind on growth and transpiration in the Italian millet, *Setaria italica. Bull. Torrey Bot. Club*, LXV, No. 4, pp. 229–232, 1 fig., (1938).

Plants of Italian millet (*Setaria italica* Beauv.) were grown in continuous wind 12 hours daily for 31 days. The tips and margins of the first three leaves began to dry after the fifth day. The treated plants grow more rapidly than the controls the first 13 days, but less rapidly thereafter. The tops of plants subjected to wind were shorter, lighter in weight, thinner stalked, and had narrower leaves and fewer tillers. These plants also had lighter and less bulky root systems. The water requirement was approximately doubled.

V. P. R.

144. **Rao, V. Panduranga**—Response of *Sorghum* to high and low soil moisture. *Bull. Torrey Bot. Club*, LXV, No. 6, pp. 413–420, 2 figs., (1938).

Sorghum plants were grown for 42 days in soil with 33·0 and 14·8 per cent moisture of which only about 20 and 1·8 per cent, respectively, were available for growth, i.e. above the hygroscopic coefficient.

Plants grown in moist soil were one-fourth taller and heavier and had one-third more photosynthetic area than those grown in dry soil. In moist soil the dried tops were twice as heavy as the roots but in dry soil the weight of tops and roots was the same. Haasis (1921), and Crist and Stout (1929) also found that the dry weight ratio of shoot to root is proportional to available soil moisture. The plants grown in dry soil had more and longer roots and nearly three times the area of those in moist soil.

Under both treatments, well developed secondary roots were produced. The moist soil proved more favourable to the development of primary roots, but the tertiaries were better in dry soil. Volumes of root systems in the moist and dry soils averaged 1·25 c.c. and 1·84 c.c., respectively. In the latter, root hairs were abundant but shorter. Dryness of soil stimulated root growth considerably and inhibited the growth of above-ground parts.

V. P. R.

145. **Sadasivan, V.** and **Sreenivasan, A.**—Studies on quality in rice. II. Chemical composition of rice varieties. *Ind. Journ. Agric. Sci.*, VIII, Part VI, pp. 807–818, (1938).

Chemical analyses of different varieties of rice grown in the Agricultural Research Stations of the Madras Presidency were made and the changes in composition as a result of (*a*) polishing, (*b*) parboiling, and (*c*) parboiling and polishing studied.

Parboiled rice, unpolished, or polished till free from bran layers, is not very different in composition from the corresponding specimen of raw rice.

Among commercial samples, parboiled (milled) rice is slightly richer in proteins and minerals than raw (milled) rice, due probably to a lesser degree of polishing in the former case.

Coloured and coarse-grained varieties of rice usually contain greater percentages of protein and minerals—particularly phosphorus—than fine-grained varieties. Such rices also require a greater degree of polishing than the others before obtaining a white (polished) grain.

Polishing results in a loss of about 30 per cent in fats, 25 per cent in proteins, and 50 per cent in ash constituents of the rice grain.

Indications have been obtained to show that the composition of rice varieties (proteins and minerals) can to some extent be enriched by suitable fertilizer applications.

V. S. & A. S.

146. **Samantarai, B.**—Respiration of amphibious plants. I. *Scirpus articulatus* Linn. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 195–204, (1938).

1. The material and the methods of finding respiration are described.
2. Respiration during the submerged phase is determined by the *p*H method.
3. Respiration of submerged scapes is recorded by the same *p*H method.
4. The aerial respiration of the scapes found out.
5. Respiration of scapes under water in various percentages of O_2 investigated.
6. It is found that the aerial respiratory values of the scapes are greater than those of the submerged phase.
7. This difference is ascribed to the low concentration of dissolved oxygen in winter.

B. S.

147. **Saran, A. B.**—A short note on the rate of respiration and respiratory quotient of starved leaves of *Aralia* sp. before and after a course of nitrogen. *Journ. Ind. Bot. Soc.*, XVII, Nos. 5 and 6, pp. 287–291, fig. 1, (1938).

No marked seasonal variation has been observed to exist in the initial rate of respiration of the leaves of *Aralia* sp.

When nitrogen is substituted for air at or beyond 44 hours of starvation the rate of respiration gets temporarily enhanced, but the same treatment given at an earlier stage (i.e. at 22 hours of starvation) leads to the lowering of the respiration rate. In both the cases, however, when air is again admitted after a course in nitrogen the rate of respiration is found to shoot up temporarily.

After a course in nitrogen, the respiratory ratio presents a low value of ·70 to ·75 for about a period of 4 hours beyond which it returns to its normal value, i.e. unity.

A. B. S.

148. SARAN, A. B.—A note on wounding of the leaves of *Anacardium occidentale* Linn. at different stages of their development and its effect on respiration. *Journ. Ind. Bot. Soc.*, XVII, No. 1, pp. 1–4, (1938).

In *Anacardium occidentale* Linn. young leaves have definitely been found to respire at a higher rate than adult ones. This rate finally settles down to a lower level value in the course of 30–40 days. Such young leaves, when wounded, do not show any after-effect, while a similar treatment to the older leaves enhances their respiratory activity considerably.

A. B. S.

149. SEN, B. and CHAKRAVARTI, S. C.—Studies in vernalization of mustard. A preliminary report. *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 245–252, pl. x, (1938).

Experiments with mustard (*Brassica juncea* Hooker, Type 27) were undertaken to find out whether mustard seeds could be effectively vernalized with a view to their possible agricultural use.

Seeds in two different stages of germination, viz. (A) seeds just sprouted and (B) seeds with unsplit seed-coats previously soaked under water for twenty-four hours were subjected to different periods of low temperature.

Results so far observed from July to October, 1937 sowings alike in pots and in small garden plots clearly indicate that:—

- (i) Plants from both (A) and (B) types of vernalized seeds show definite earliness in the opening of first flowers as compared to the plants from control seeds grown under similar conditions.
- (ii) For the same dose of chilling the degree of vernalization induced in sprouted seeds is much greater than that induced in unsplit seeds.
- (iii) Against this one advantage of the sprouted vernalized seeds, unsplit vernalized seeds offer several and these are of a more significant nature for the purpose of practical agriculture.

Experiments are planned for this summer (1938) to find out the maximum degree of vernalization that can be induced in unsplit seeds by increasing the dose of chilling and also to determine the number of days unsplit vernalized seeds can retain the effect of vernalization when dried.

B. S. & S. C. C.

150. SINGH, B. N., KAPOOR, G. P. and CHOUDHRI, R. S.—The light factor in crop production. *Proc. Ind. Acad. Sci.*, VII, No. 3, Sec. B, pp. 143–160, figs. 8, (1938).

The present investigation is aimed at a quantitative determination of the growth behaviour of certain crop plants in relation to alterations in the light duration. Recourse is taken to pot-culture experiments conducted under carefully controlled laboratory conditions. The photoperiod is varied in ten different sets from plants growing in complete darkness on the one hand to continuous illumination on the other. The data collected are tested for significance and analysed with special reference to crop production relative to light rationing.

In durations shorter than twelve hours, plants fail to grow normally, development of chlorophyll and plant parts as also the production of dry matter and grain yields are retarded more and more with the decrease in the duration of illumination. Blossoming and maturation are generally delayed with the exception of plants growing under very short durations which die prematurely.

Plants behave differently when grown under long durations of illumination. *Crotalaria* thrives best in twelve hours; *Hordeum, Gossypium* and *Triticum* in fifteen hours, while *Linum* and *Brassica* need eighteen hours daily illumination. With changes in the photo period, however, the growth mechanism of plants remains more or less unaffected.

The occurrence of sexual reproduction in plants is only confined to certain specific limits, below which they tend to become sterile while beyond that giant growth sets in.

The need for light among the different competitors of a plant society differs widely from crop to crop; those having simpler end-products seem to need less light than the more complex ones. Plants of more or less similar constitutions growing in different seasons of the year also differ markedly in their light requirement due perhaps to seasonal adaptations.

B. N. S., G. P. K. & R. S. C.

151. SINGH, B. N., LAL, K. N. and PRASAD, K.—Photosynthetic specificity in relation to biochemic constitution of leaves. *Proc. Ind. Acad. Sci.*, VIII, No. 4, Sec. B, pp. 301–308, (1938).

An attempt has been made in this paper to study the photosynthetic activity of a number of plant species under optimum yet identical conditions of factor-intensity and to trace the relationship, if any, between the organic materials subsequently formed and the assimilatory influx of carbon dioxide.

Different plant species have different photosynthetic rates, the range of variation from species to species becoming more and more pronounced with advance in age of plants. Such variations under otherwise constant external conditions are discussed with special reference to internal factors.

The water-content of the experimental material no doubt differs from plant to plant but does not follow the same gradation as that maintained by the assimilation rate. The chlorophyll content too shows no correlation with the assimilatory efficiency.

There seems to be a fair degree of correlation between the products economized in leaves during their photosynthetic activity and the products stored by the same species towards the close of the life-cycle. Plants economizing sugars, proteins, starches and fats in assimilating leaves also store such substances respectively in their storage organs towards the close of their life-cycle.

The photosynthetic rate seems to be related to the nature of the end products accumulating in assimilating leaves. Leaves accumulating simpler sugars have fairly high rates of assimilation while those economizing the more complex starches, proteins and fats respectively have to their credit decreasing assimilatory efficiency.

The biochemic constitution of the experimental material as judged by the products economized during assimilation appears to be an important internal factor governing photosynthesis and suggestively explains the phenomenon of photosynthetic specificity in certain groups of crop plants.

B. N. S., K N. L. & K. P.

152. SINGH, B. N., MATHUR, P. B. and MEHTA, M. L.—The presence of cellulase in potato sprouts. *Current Science*, VII, No. 6, pp. 281-282, (1938).

A peculiar case in which potato sprouts digested the cardboard walls of the packages was noticed by the authors. To test the digestive power of potato sprouts, they performed certain experiments with the sprouts placed in a flask containing the cardboard + ammonium carbonate suspension and kept in an incubator at 30°C.

It is evident from the data that a greater percentage of loss in cellulase is attributable to the loss of xylan which being less resistant than cellulase is easily digested by potato sprouts.

P. P.

153. SINGH, B. N., and PRASAD, S.—The effect of chlorine in relation to age upon the growth and composition of wheat. *Proc. Ind. Acad. Sci.*, VIII, No. 4, Sec. B, pp. 324–335, figs. 5, (1938).

The application of chlorine from the very beginning of the life-cycle of wheat brings about a slight depression in dry matter production and an increase in moisture content during the early stages of growth. With advance in age, however, the dry matter accumulation is markedly increased without any appreciable increase in water content.

Plants supplied with chlorine twenty days after germination have the maximum dry matter yield. Relative growth rate as well as net assimilation rate are also accelerated.

The treated plants do not show any marked effect on their shoot length although the assimilatory surface is increased beyond the control. The roots, on the other hand, in spite of a diminution in length, exhibit a greater lateral ramification and dry matter production.

Chlorine-treated plants have a larger percentage of ear formation, maximum values being obtained in cases where this element is supplied twenty days after germination.

. The accumulation of carbohydrates as also the diastatic activity are greater in the treated plants as compared to the control ones.

Growth of plants at successive stages of the life-cycle appears to be determined by both the age and the factor for chlorine, a change in either bringing about a variation in dry matter production.

The greatest physiological need and hence the maximum augmentative efficiency of this element is found at the period (twenty days after germination in the present case) when plants are showing active growth and differentiation. B. N. S. & S. P.

154. SINGH, B. N. and RAO, N. K. ANANTHA—A photoelectric photometer for chemical analysis. *Plant Physiology*, XIII, No. 2, pp. 419–425, 3 figs., (1938).

A photoelectric apparatus for chemical analytic purposes is described.

The principle of the apparatus is the measurement of light absorption of a solution within a narrowly defined region of the spectrum with the aid of a measurably variable light diminution.

The special advantages and applications of the apparatus are given.

The accuracy is ± 2·24 per cent. B. N. S. & N. K. A. R.

155. SINGH, B. N. and RAO, N. K. ANANTHA—Photoelectric saccharimeter.—A new physical instrument for the polarimetric estimation of cane-sugar. *Current Science*, VI, No. 10, pp. 506-507, (1938).

The authors have developed a new photoelectric saccharimeter, and have given the description and the principle of its operation. The instrument offers over the existing ones the advantages of a combination of stability, sensitivity and simplicity, as they remark after working with it. P. P.

156. VARMA, S. C.—On the nature of competition between plants in the early phases of their development. *Annals of Botany*, II, No. 5, pp. 203–225, pl. vi, 5 text-figs., (1938).

Experiments are described in which various species were grown in two densities, in pure and in mixed cultures. The results indicate that judged by the mortality rates the intensity of competition is usually greater in mixed cultures than in cultures of individuals of a single species. Nevertheless, the evidence afforded suggests that severity of competition may in certain cases be as great or greater between the individuals of the same species. Thus Darwin's generalization may be applicable to certain species though not to others.

The depressing effect of one species upon another is shown to be, in part at least, due to soluble toxic substances probably formed by the roots. Evidence is furnished that these soluble substances cause an augmentation of the *suction force* and depress the root development. S. C. V.

SYSTEMATIC BOTANY.

157. ANAND, P.—Contributions to our knowledge of Indian marine algae. I. On some green algae from Karachi. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 134, (1938).

158. BARNES, E.—Supplement to the flowering plants of Madras City and its immediate neighbourhood. *Bull. Madras Govt. Museum*, New Series—N.H. Sec., IV, No. 2, (1938).

This bulletin contains a description of 51 species of flowering plants found in the neighbourhood of Madras City which were not included in the main volume (*Bull.* N.H., Vol. II, 1929). Keys or notes for their identification are given and there are line diagrams of 23 plants.

F. H. G.

159. BHASHYAKARLA RAO, C.—The Zygnemoideae of the Central Provinces, India—I. *Journ. Ind. Bot. Soc.*, XVII, Nos. 5, and 6, pp. 341–353, (1938).

In this part the author records 25 forms of Zygnemoideae of which one belongs to the genus *Zygnema*, 20 belong to *Spirogyra*, 2 belong to *Mougeotia* and 2 to *Sirogonium*. He gives the systematic enumeration of the species observed, and describes their habit and habitat and notes the actual measurement of the cells and zygospores of the forms mentioned.

P. P.

160. BHASHYAKARLA RAO, C.—The Myxophyceae of the Madras Presidency, India—I. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 81–96, (1938).

This communication deals with some of the Myxophyceae of the Madras Presidency. In all seventy forms representing twenty two genera have been described and out of these two species and seven forms are new.

P. P.

161. BISWAS, K. P.—Observations on the flora of Bhutan. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 136, (1938).

162. BOERGESEN, F.—Contributions to a South Indian marine algal flora—III. *Journ. Ind. Bot. Soc.*, XVII, No. 4, pp. 205–242, (1938).

In the third and last part of his contributions the author records 39 species of South Indian marine algae of which 2 belong to Phaeophyceae and the rest to Rhodophyceae.

P. P.

163. BOR, N. L.—A list of the grasses of Assam. *Ind. For. Rec.*, (B) I (3), pp. 47–102, pl. 5, (1938).

A list of the grasses so far known to inhabit Assam has been drawn up. Six grasses new to science, viz., *Sclerostachya milroyi*, *Themeda nuttonensis*, *Rottboellia goalparensis*, *Deyeuxia nagarum*, *Ischaemum hubbardii*, *Hyparrhenia griffithii*, have been described and five of them figured. The following new combinations have been made: *Helictotrichon asperum* Bor, *Arundinella griffithiana* Bor, *Acroceras tonkinense* (Bal.) Hubbard mss., *Microstegium petiolare* Bor, *Cymbopogon khasianus* Stapf. mss., *C. hookeri* Stapf. mss., *Schizachyrium delavayi* Bor. The modern names of the species have been given together with the synonym as it appears in Hooker's ***Flora of British India***. The type sheets of the new species are preserved in the herbarium of the Forest Research Institute, Dehra Dun.

N. L. B.

164. BOR, N. L.—*Gynura crepidioides* Benth. *Current Science*, VII, No. 3, p. 116, (1938).

The author discusses the rapid spread of *Gynura crepidioides* Benth., an African compositae in the plains and hills of Assam.

He did not observe it at Jamiri (4000) in the Aka Hills in 1931, but it had made its appearance there by 1934. In 1935, he noticed this species in the Naga Hills. It is one of the commonest weeds in Sadiya where, from the rapidity with which it grows, it has become a pest in regeneration areas of *Terminalia myriocarpa*.

It is not mentioned by Calder and his collaborators in their list of species of phanerogams not included in the *Flora of British India*. One can conclude from this that *Gynura crepidioides* was absent from the flora in 1926.

For a plant to have spread all over the Province of Assam, situated as it is hundreds of miles from any seaport, shows powers of migration and ecesis which are very remarkable. One factor which has undoubtedly a very important bearing upon its distribution is its capacity for producing flowers and fruits all the year round, as well as its tolerance towards very diverse edaphic conditions.

P. P.

165. **Chaudhuri, H.** and **Umar, Mohammad**—Molds of the Punjab—I. The Aspergilli. *Proc. Ind. Acad. Sci.*, VIII, No. 2, Sec. B, pp. 79–92, (1938).

In this paper, the Aspergilli isolated and studied by the senior author and his pupils have been listed. Descriptions of many of these have been published already. The descriptions of the rest of the species are given. Also all Aspergilli, so far noted in India, have been listed in the paper. Thom and Church's (1926) method of description has been followed generally.

P. P.

166. **Chaudhuri, H.**—Molds of the Punjab—II. The Penicillia. *Proc. Ind. Acad. Sci.*, VIII, No. 2, Sec. B, pp. 93–99, (1938).

In the second paper on the Molds of the Punjab, the Penicillia are grouped together. Out of 15 species of *Penicillium* and one of *Scopulariopsis* listed in this paper, 11 have been studied by the author. The remaining 5 have been included to make the list so far complete for all India. Of the forms studied by him, descriptions of some have already been published by the author and his students, descriptions of the rest of the species as well as illustrations of most of the species noted from his laboratory are given. Thom's (1930) method of description has been followed generally.

P. P.

167. **Chopra, R. S.**—Notes on Indian Hepatics. I. South India. *Proc. Ind. Acad. Sci.*, VII, No. 5, Sec. B, pp. 239–251, (1938).

The author gives a list of Indian Hepatics from South India. An examination of the forms collected by him shows three new species and several new records.

P. P.

168. **Chopra, R. S.**—Notes on Indian Hepatics. II. Sikkim Himalayas and Bengal. *Proc. Ind. Acad. Sci.*, VIII, No. 6, Sec. B, pp. 427–439, (1938).

The writer gives a list of some new species of Hepatic flora of Sikkim and Bengal with the localities where they occur.

P. P.

169. **Ghosh, A. K.**—On the floristic elements of the flora of Bengal, Bihar and Orissa and their origin. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 140, (1938).

170. **Ghosh, S. L.** and **Hussain, Dilawar**—A contribution to the life-history and cytology of some Punjab Zygophyllaceae. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 150, (1938).

171. **Iyengar, M. O. P.**—A note on two interesting South Indian marine algae; *Pseudovalonia Forbesii* (Harv.) Iyengar comb. nov. and *Pesudobryopsis pambanensis* sp. nov. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 132, (1938).

172. Iyengar, M. O. P.—A note on a *Physocytium* from South India. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 133, (1938).

173. Iyengar, M. O. P.—On the structure and life-history of *Pseudovalonia Forbesii* (Harv.) Iyengar (*Valonia Forbesii* Harv.) Preliminary note. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 191–194, (1938).

Living material of this alga was grown at Madras in the laboratory and the several stages of its life-history were studied. This alga was until now placed in the genus *Valonia,* but a study of its structure and development shows that it is not a *Valonia.* The peculiar lenticular cells and the tiny marginal cells bearing short rhizoids which are so characteristic of *Valonia* are never formed in this alga.

A new genus *Pseudovalonia* is therefore created for this alga.

The author has given the description of the vegetative and reproductive bodies of the genus *Pseudovalonia* gen. nov. Asexual reproduction takes place through the formation of numerous four ciliated swarm spores formed inside the vesicle; sexual reproduction is not known.

P. P.

174. Jacob, K. C.—Grass flora of the Kollegal Forest Division with short notes and vernacular names wherever available. *Ind. For.*, LXIV (7), pp. 419–429, (1938).

Describes a survey of the grass flora of the Kollegal Forest Division in the Coimbatore District. The grasses in this Forest Division are very important since one half of the forest revenue of this Division is derived out of the grazing permits issued to cattle owners.

Sixty-five out of 390 species of the Madras grasses from an area of about 1,000 square miles were collected. 40 of these are good fodder grasses. Short notes on the fodder value are given for all the species of grasses. A few suggestions for the improvement of these grazing areas are also given.

K. C. J.

175. Khanna, L. P.—On two species of *Anthoceros* from China. *Journ. Ind. Bot. Soc.*, XVII, Nos. 5 and 6, pp. 311–323, (1938).

The author gives the description of two species of *Anthoceros* from China—*A. fulvisporus* Stephani and *A. Chungii* sp. nov. He also gives two charts—one showing differences between those species of *Anthoceros* Linn. 1753 with solid thallus and pale spores and another showing differences between those species of *Anthoceros* Linn. with cavernous thallus and dark spores.

P. P.

176. Krishna, S. and Ghose, T. P.—*Derris ferruginea* Benth. from Assam. *Current Science,* VII, No. 1, p. 22, (1938).

So far, *Derris elliptica* has not been found to occur in India. The species previously described as *D. elliptica* (*Current Science*, 4, 857, 1936) has now been definitely identified as *D. ferruginea.* Localities in Assam, where this rotenone bearing species occurs, have been described.

S. K. & T. P. G.

177. Mahabale, T. S.—On a new species of *Isoetes* in India. *Current Science,* VII, No. 2, pp. 62-63, (1938).

The author came across a small form of *Isoetes* at higher elevations in the Sahyadris, which turned out to be a new species.

He has given the general description and discussed the systematic position of the new species which has been provisionally called *Isoetes sahayadrii* sp. nov.

P. P.

178. MITTER, J. H. and TANDON, R. N.—Fungi of Nainital. Part II. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 177–182, (1938).

The authors have given a list of 79 species of fungi. Fifteen of the species and one genus are new. Another fifteen species are on new hosts. Nineteen fungi are not mentioned by Butler and Bisby in 'The Fungi of India'.

P. P.

179. MUNDKUR, B. B. and PRASAD, N.—On a new *Revenelia* from India. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 144, (1938).

180. PARKER, R. N.—Collett's Flora Simlensis. *Ind. For.*, LXIV (1), pp. 3–7, (1938).

A few species found in the Simla neighbourhood are mentioned as having been omitted from Collett's Flora Simlensis and as they are not numerous it is concluded that the Flora was reasonably complete. Changes that have taken place in the vegetation are the disappearance of the more ornamental plants due to picking flowers and digging up roots. Additions have occurred owing to exotic weeds and garden plants becoming established of which a list is given.

R. N. P.

181. PURKAYASTHA, C. S.—Four new species from Assam. *Ind. For. Rec.*, LXIV (5), pp. 276–281, 4 pls., (1938).

The author describes *Quercus milroyii* (Fagaceae) from N.E. Frontier Tract, *Salacia khasiana* (Celastraceae) and *Ilex khasiana* (Ilicineae) from Khasi Hills and establishes a new genus *Purkayasthaea* (Lauraceae) containing a single species *P. pseudomicropora* from Lakhimpur District.

M. B. R.

182. PURKAYASTHA, K. K.—A new species of *Phoebe* from Assam. *Science and Culture*, III, No. 7, pp. 402-403, (1938).

The author records a new species of *Phoebe*—*P. assamica* from Assam and gives the general description of the plant.

P. P.

183. RAMANATHAN, K. R.—On a form of *Anabaenopsis* from Madras. *Journ. Ind. Bot. Soc.*, XVII, Nos. 5 and 6, pp. 325–339, figs. 15, (1938).

A new variety of *Anabaenopsis Arnoldii* Aptek. is recorded from the estuarine region of the River Cooum at Madras.

A detailed account of the structure and nature of the different layers of the cell-wall, especially that of the outermost mucilaginous envelope is given.

The origin and development of the heterocysts and the spores are described in detail.

The variations in the appearance of the trichome due to the irregularities in its fragmentation are explained.

It is pointed out that, though the presence of a heterocyst at each end of the trichome has been accepted as the chief feature of the genus *Anabaenopsis*, the other and more important feature mentioned by Miller (1923) in his original diagnosis of the genus, viz. the method of origin of the paired intercalary heterocysts by an unequal division of two adjoining cells, has not been given proper emphasis by the later authors. It is suggested that this characteristic method of origin of the heterocysts should be made the main distinguishing feature of the genus, the presence of a heterocyst at each end of the trichome being considered as a feature of only secondary importance.

K. R. R.

184. RANDHAWA, M. S.—Observations on some Zygnemales from Northern India.—Part I. *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 109–150, (1938).

The author gives the general description, habit, periodicity in occurrence and reproduction affinities and characteristics used for generic and specific identification of some Zygnemales from Northern India. He has divided the Northern Indian Zygnemales into three groups: (I) Late autumn and early winter annuals. (II) Later winter and spring annuals, and (III) Ephimerals. In this part of his paper the author records one species of *Debarya*, 9 species of *Mongeotia*, 10 species of *Zygnemopsis* and 12 species of *Zygnema* and gives a good account in each case.

P. P.

185. **Randhawa, M. S.**—Observations on some Zygnemales from Northern India.—Part II. *Proc. Ind. Acad. Sci.*, VIII, No. 4, Sec. B, pp. 336–366, (1938).

In this second part the author describes 32 species of *Spirogyra* and 2 species of *Sirogonium*.

P. P.

186. **Rao, C. Bhashyakarla**—The Myxophyceae of the Orissa Province, India. I. *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 157–170, (1938).

In this communication fifty-nine forms of the Myxophyceae have been recorded, and out of these three varieties and eight forms are new. The author gives the general description and systematic enumeration of the species observed.

P. P.

187. **Sayeedud-Din, M.**—A further contribution to some of the common flowering plants of the Hyderabad State. Their distribution and economic importance. *Journ. Bombay Nat. Hist. Soc.*, XL, No. 2, pp. 191–212, 1 map, (1938).

The author here records 255 species belonging to 70 families. Mention is made of their habitat, vernacular names, economic uses and medicinal importance.

P. P.

188. **Schmid, E.**—Contribution to the knowledge of flora and vegetation in the Central Himalayas. *Journ. Ind. Bot. Soc.*, XVII, No. 4, pp. 269–278, (1938).

The author devides the Central Himalayas into 5 Belts—the subalpine Forest Belt (Larch-Pinus Cembra Belt), the Pulsatilla-Forest-Steppe Belt, the Alpine Dwarf Shrub-Tundra, the Carex-Elyna Belt, and the Stipa-Steppe Belt and notes the flora and vegetation of them. He has tried to sketch the relations of the Alpine region to the great Eurasiatic vegetation units.

P. P.

189. **Singh, Rama Nagina**—The Oedogoniales of the United Provinces, India. I. *Proc. Ind. Acad. Sci.*, VIII, No. 5, pp. 373–395, (1938).

The present communication deals with some of the forms collected from the rice fields of Gorakhpur and Benares during the last two years. In all twenty-five forms have been recorded, and out of these six species, six varieties and thirteen forms are new.

P. P.

190. **Singh, R. N.**—The Zygnemoideae of the United Provinces, India. II. *Journ. Ind. Bot. Soc.*, XVII, Nos. 5 and 6, pp. 369–384, (1938).

Most of the forms that are described in this paper have been collected from Gorakhpur and its environs during the last two years. Four forms collected from Benares and one from Sakaldiha have also been included. With the exception of *Zygnema globosum* Czurda. and *Spirogyra varians* (Kutz.) Czurda. all the plants were got from rice fields. In all twenty-five forms have been recorded, and out of these six species, four varieties and eleven forms are new.

P. P.

PALEOBOTANY.

191. **JACOB, K.**—Jurassic plants from Tabbowa, N.-W. Ceylon. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 152, (1938).

192. **JACOB, K.**—Fossil plants from Sakrigalighat in the Rajmahal Hills, with remarks on the age of the beds. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 152, (1938).

193. **JACOB, KURIEN**—Fossil algæ from Waziristan. *Journ. Ind. Bot. Soc.,* XVII, Nos. 2 and 3, pp. 173–176, (1938).

The author has given the description of four specimens of fossil algæ collected by Capt. Stuart from the Janjal Plant Series. He has identified them as (1) *Algites* cf. *A. Meyrati* (Fisch-Oost.), (2) *Algites* cf. *A. intricatus* (Sternb.), (3) *Algites* cf. *A. Targionii* (Brongn.), and (4) *Algites* sp. He has compared the first with a possible algal impression described as *Sphaerococcites Meyrati* by Heer, the second with Heer's figures of *Chondrites intricatus*, the third with Heer's figures of *Chondrites Targionii*, and the fourth with *Halymenites lumbricoides* Heer.

P. P.

194. **KAUL, K. N.**—An analysis of the artificial genus *Palmoxylon* into natural genera. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 149, (1938).

195. **RAO, A. R.**—Two petrified strobili from the Rajmahal Hills, Bihar. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 151, (1938).

196. **RAO, L. RAMA**—Recent discoveries of fossil algæ in the Cretaceous rocks of South India. *Current Science,* VIII, No. 5, pp. 218–220, (1938).

The writer gives a general account of the fossil algæ collected and studied by him and his colleagues from South India with special reference to a few forms of outstanding stratigraphical or paleobotanical importance. Among the algæ from the Nimyar division the following groups are represented: (*a*) the Rhodophyceæ represented by the Solenoporaceæ and the Corallinaceæ, (*b*) the Chlorophyceæ represented by Dasycladaceæ, and (*c*) the Chætophoraceæ. The Nimyar fossils add considerably to the knowledge of Cretaceous algæ. In the 'coral reef limestones' at the base of the Utatur division plenty of algæ have been noted. These limestones are of Cenomanian age and thus older than the rocks of the Nimyar division which are Danian. Pondicherry limestone containing fossil algæ are between Cenomanian and the Danian. Fossil algæ from Rajahmundry are of upper Cretaceous age. Thirteen species of *Chara*, of which 9 are of those already known and the other 4 appear to be new, have been collected from the Rajahmundry intertraps, and they are all tertiary forms. From this account it will be seen that a very rich and varied algal flora has been discovered in the Cretaceous and early Tertiary beds of S. India.

P. P.

197. **RAO, S. R. NARAYANA, RAO, K. SRIPADA** and **PIA, JULIUS**—Calcareous algæ from the Intertrappean beds near Rajahmundry. *Current Science,* VI, No. 8, pp. 376-377, (1938).

The authors give a provisional list of the Dasycladaceae with the stratigraphic range of the genera. They discuss each genus separately and conclude that the Dasycladaceæ of the Rajahmundry limestones do not yet supply a sufficient basis for the exact determination of the geologic age. They add, however, markedly to the probability, that the traps of the Rajahmundry area erupted in Tertiary, not in Cretaceous time.

P. P.

198. **Shukla, V. B.**—On a new species of *Dadoxylon*, *D. Deccani*, sp. nov., from the Deccan Intertrappean series. *Journ. Ind. Bot. Soc.*, XVII, Nos. 5 and 6, pp. 355-367, figs. 10, (1938).

A piece of secondary wood has been described here which belongs probably to the Deccan Intertrappean Series. The name *Dadoxylon Deccani* sp. nov. has been given to it. The wood shows opposite pits in addition to the contiguous hexagonal pitting characteristic of the Araucarineæ. This combination of two characters indicates that the wood may be considered as a connecting link between the Araucarineæ and the Abietineæ.

V. B. S.

199. **Sitholey, R. V.**—Jurassic plants from Afghan-Turkistan. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 151, (1938).

200. **Virkki, Chinna**—A Lower Gondwana flora from the Salt Range, Punjab. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 150, (1938).

ECONOMIC BOTANY.

201. **Alam, Ch. Nek**—Minimum adequate size of sample of F_2 required in experiments on hybrid vigour and inheritance of quantitative characters. *Current Science*, VII, No. 3, pp. 110-111, (1938).

The author discusses the size of the sample of F_2 and the layout of the experiment for the study of hybrid vigour and inheritance of quantitative characters. He suggests that comparison of F_2 with parents and F_1 in randomised blocks or latin squares will only be admissible if in each block, row or column such a sample is grown as may either be the same as the expected F_2 population or a representative of it. He points out the necessity of determining the adequate size of a sample for each and every character of all the crosses.

P. P.

202. **Ammal, E. K. Janaki**—Chromosome behaviour in *Saccharum spontaneum* × *Sorghum durra* hybrids. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 143, (1938).

203. **Ammal, E. K. Janaki**—Chromosome numbers in Sugarcane × Bamboo hybrids. *Nature*, CXLI, No. 3577, p. 925, (1938).

The author shows that hybrids obtained by crossing Java sugarcane (female) with bamboo show that only the offspring derived from parent cells containing the basic (haploid) number of chromosomes survive. In this they differ from *Saccharum* × *Sorghum* hybrids, which give viable hybrids also from diploid parent cells (containing twice the basic haploid number of chromosomes).

P. P.

204. **Ammal, E. K. Janaki**—A *Saccharum* × *Zea* cross. *Nature*, CXLII, No. 3596, pp. 618-619, (1938).

A photomicrograph of the chromosome complex in a hybrid between the sugarcane and the Indian corn is submitted by Dr. E. K. Janaki Ammal, showing that a majority of the chromosomes come from the female sugarcane parent. The cross is a dwarf plant resembling a sugarcane but having the characteristic epidermal hair found on the upper side of the leaf in *Zea Mays*.

P. P.

205. **Anon.**—Ascu—a wood preservative. *Ind. For. Rec.* (U), I (6), pp. 143-187, pl. 5, (1938).

The *Record* presents a general description of Ascu wood preservative—its composition, different methods of treatment, types of plants recommended, and tabulated results of

tests and experiments carried out on the preservative at the Forest Research Institute, Dehra Dun, and other parts of India and also in other countries.
H. T.

206. Anon.—Graphs giving volume/age for the more important species found in Northern and Southern Bengal, compiled in the office of the Silviculturist, Bengal. Part 1. *Bengal For. Bull.*, No. 2, (1938).

The graphs have been prepared from stem analyses made by the Provincial Silviculturist. The quality or locality classes have not been taken into consideration and the data are provisional, being meant only to give very rough indications of rates of growth of the species mentioned.
J. N. S. G.

207. Anon.—Brush treatments with wood preservatives. *Ind. For.*, LXIV (2), pp. 113-116, 1 pl., (1938).

The best method of applying brush treatments with wood preservatives is described along with the limitations of this process.
J. N. S. G.

208. Anon.—India aids the Sudan. *Ind. For.*, LXIV (9), pp. 573-574, (1938).

The *neem* (*Azadirachta indica*) tree of India is now acclimatized in the Sudan and has proved a satisfactory windscreen for the protection of plantations.
J. N. S. G.

209. Anon.—Ephedra. *Ind. For.*, LXIV (10), pp. 632–636, (1938).

The introduction of the drug *Ephedra* into Western medicine for the treatment of asthma and hay fever is quite recent. Five species of the genus are stated to occur in India, chiefly at high altitudes in the mountains of Baluchistan and the Himalayas. Of these, two closely allied species *E. nebrodensis* and *E. gerardiana* are said to have given very promising results. The influence of rainfall plays an important part in ephedrine content, a high content being associated with a low rainfall. Suggestions have been made to raise the species in different parts of the empire.
J. N. S. G.

210. Anon.—Yerba de la Pulga Plant. *Ind. For.*, LXIV (11), pp. 708-709, (1938).

Extensive experiments indicate that this plant possesses exceptional insect-repelling qualities. It does not only contain, but actually exudes, sufficient quantities of the drug 'rotenone'—one simple plant repelling all forms of insects in an area of 15 to 20 sq. ft.
J. N. S. G.

211. Ayyangar, G. N. Rangaswami and Ayyar, M. A. Sankara—Linkage between a panicle factor and the pearly-chalky mesocarp factor (*Zz*) in *Sorghum*. *Proc. Ind. Acad. Sci.*, VIII, No. 2, Sec. B, pp. 100–107, pl. II, (1938).

In the group of *Sorghum*, *S. dochna* (Forsk) Snowden, two types of panicles have been met with. In the loose conical type the panicle branches are long and the earhead is conical in appearance owing to their decreasing length from base to tip. In the compact spindle type this conical disposition is also there, the cone being narrower, but the panicle branches are considerably shorter in length and due to the absence of the pulvinus-like structure in the axil of the panicle branches; they are adpressed to the central rachis giving the earhead a spindle-shaped look. In these spindle-shaped earheads, the rachis is slightly reduced in length, the number of side branches decreases and the number of fertile spikelets (grains) also decreases. The leaves also make a slightly narrower angle with the stem.

A factor Pa_1 produces loose conical earheads; factor pa_1 results in compact spindle-shaped earheads. These factors Pa_1pa_1 affecting the panicle shape are closely linked to the factors ***Zz*** governing the thickness of mesocarp and the deposit of starch in it, with a cross-over value of 1·07 per cent. G. N. R. A. & M. N. S. A.

212. AYYANGAR, G. N. RANGASWAMI and NAMBIAR, K. KUNHI KRISHNAN—A 'Tiny' *Sorghum*. *Proc. Ind. Acad. Sci.*, VIII, No. 4, Sec. B, pp. 309–316, (1938).

In *Sorghum*, a new gene designated In_{ty} is responsible for an extreme reduction in the internodal length, producing tiny plants. Internodal number is not affected but internodal length only. The wide divergence in internodal length is less graphic in its effect on leaf-sheath length. With reference to the leaf-blade, its length is more affected than its breadth. This gene does not affect the number of whorls on the earhead but has its effect in the panicle having a lesser number and shorter length of secondary panicle branches resulting in fewer spikelets per earhead. Glume size remains practically unaffected. So also ovary and stigma size. The anthers and filaments are reduced in size. The anthers are devoid of pollen. Dwarf plants are therefore usually sterile. Stray pollen grains could be found in some anthers and fertilization by them results in seeds giving true-breeding tiny plants. The stigmas are very receptive and natural crossing is chronic. Plants heterozygous for the character are the main source of their reproduction. Factor in_{ty} is a simple monogenic recessive to In_{ty}. G. N. R. A. & K. K. K. N.

213. AYYANGAR, G. N. RANGASWAMI, RAO, V. PANDURANGA and REDDY, T. VENKATARAMANA—The occurrence and inheritance of purple anthers in *Sorghum*. *Proc. Ind. Acad. Sci.*, VIII, No. 4, Sec. B, pp. 317–323, (1938).

Anthocyanic purple pigment expresses itself in the *Sorghum* plant in various places and at various times. This occurrence could be grouped into specific chains of manifestation. The anther is rarely coloured purple. When it is so coloured, it is one among the following ten places in its chain: plumule, nodal band, axil, auricular junction, leaf-sheath margin, pulvinus of the panicle branches, pedicelled spikelets, glume tips, exposed roots and pericarp of the grain at milky stage. The expression of this purple in freshly emerging anthers is noted in some races of cultivated *Sorghum*, East African and Nigerian in origin, belonging to the groups *S. caudatum*, *S. coriaceum*, *S. nigricans*, *S. elegans*, *S. Roxburghii*, and *S. conspicuum*. Purple in the anthers occurs in the wild sorghums *S. halepense* of the Eu-Sorghum group, and *S. versicolor*, *S. dimidiatum* and *S. purpureo-sericeum* of the Para-Sorghum group. A gene designated P_{an} is responsible for this expression of purple in the anther. In its absence (p_{an}) the anther is of the ordinary yellow colour. P_{an} is a simple dominant to p_{an} in crosses between African races. Factor P_{an} behaves in inheritance independently of one of the B factors determining the brown colour of the grain, of the Q factor conditioning the colour of the leaf-sheath and of the factor responsible for the production of brown colour in the nucellar layer of the grain. The occurrence of this dominant gene, along with other similar dominant pigment genes in African races and their disappearance in the Indian and other Asiatic races, throws light on the origin and evolution of cultivated sorghums.

G. N. R. A., V. P. R. & T. V. R.

214. AYYANGAR, G. N. RANGASWAMI, RAO, V. PANDURANGA and PONNAIYA, B. W. X.—The occurrence and inheritance of purple-tipped grains in *Sorghum*. *Proc. Ind. Acad. Sci.*, VIII, No. 5, Sec. B, pp. 396–398, (1938).

Almost all grain sorghums are without a purple spot on the top of their grains. In these, the tip of the grain has merely the brownish scar left by the dried stylar base. In some varieties of Kafir the stylar scar is surrounded by a small purple spot. In African Kafirs this purple spot is either feeble or latent. In some Kafirs from America the spot is patent. In crosses with varieties with no purple-tip on the grain the purple-tipped grain behaves as a simple Mendelian dominant to the common tipless condition. The gene responsible for this purple-tip on the top of the grain has been designated P_{GT}. In the presence of 'Q' factor this spot is reddish purple. With 'q' it is blackish purple. The purple on the tip of the grain belongs to the same series as the leaf-sheath purple, and the glume purple that goes with it. This factor is independent of the factor 'W' which determines the manifestation of pericarp colour in wholeness. The presence of this dominant colour character in the African Kafir and its disappearance in other cultivated sorghum throws light on the origin and distribution of many of the cultivated sorghums.

G. N. R. A., V. P. R. & B. W. X. P.

215. AYYANGAR, G. N. RANGASWAMI and PONNAIYA, B. W. X.—'Knife Cut' at the base of the peduncle of *Sorghum*. *Current Science*, VII, No. 4, pp. 183–185, (1938).

A rare and interesting instance of a 'Knife Cut' has been met with in *Sorghum*. This occurred in one of the lines of Sudan grass bred for fodder value and got down from the All-Union Research Institute of Plant Breeding—Section of Forage Plants, Odessa, U.S.S.R. In this line, from a third to a fourth of the population gave plants with knife cuts at the base of the peduncle.

In the breeding of Sudan grass for better fodder purposes, it looks as if some sweet sorghum blood, probably *S. bicolor* in origin, has been infused into this grass.

An examination of the leaf-sheaths in this 'Knife Cut' family shows that the average thickness of the dry leaf-sheath is 1·2 mm. as against 0·5 mm. of the leaf-sheath of pure Sudan grass. It looks therefore that in this line, there is a misfit between the leaf-sheath and earhead equipment, finding expression in the mutilation under record. Like goose-necking, this character manifests only under optimum conditions. When the earhead manages to escape the impediments in its emergence, the cut does not appear.

P. P.

216. AYYANGAR, G. N. RANGASWAMI and NAMBIAR, A. KUNHIKORAN—The coupling phase of the linkage relationship between 'leaf-sheath-glume' and 'dry-anther-grain' colours in *Sorghum*. *Current Science*, VII, No. 1, pp. 17–19, (1938).

Most of the African races of *Sorghum* have a blackish-purple leaf-sheath and glume, brown colour in the dry anther and a brown wash on their grains (*qqBB*). The Asiatic races are predominantly characterised by having a reddish-purple leaf-sheath and glume, no brown colour in the dry anther and no brown wash on their grains (*QQbb*). There is a complete linkage between *Qq* (factors for leaf-sheath and glume colour) and *Bb* (factors for brown colour in dry anther and grain). This has been established in both the repulsion and coupling phases by suitable crosses.

P. P.

217. AYYANGAR, G. N. RANGASWAMI and NARAYANAN, V.—The occurrence of hollow grains and hollow peduncles in *Sorghum*. *Current Science*, VII, No. 4, p. 185, (1938).

An examination of the foreign grain sorghums reveals the fact that varieties from China belonging to the group *S. nervosum* are hollow in the tops of their peduncles; so also the African grain sorghums belonging to the group *S. nigricans* from Tanganyika, N. Rhodesia and Belgian Congo. These two groups of *Sorghum* have grains that are soft.

In the *nigricans* group of *Sorghum* there is a hollow in the centre of the grain at the dough stage. This hollow is clear in one particular family, viz. A.S. 4660, which has fairly big grains. In this, the peduncle also showed the hollow fairly well.

P. P.

218. AYYANGAR, G. N. RANGASWAMI, PONNAIYA, B. W. X. and REDDY, T. VENKATARAMANA—*Sorghum*—purple pigment in the late-seedling stage. *Current Science*, VI, No. 12, pp. 612-613, (1938).

A new type of specialised manifestation of the purple pigment in the life-history of the *Sorghum* plant has recently been met with. In this type, the pigment manifests itself in the late-seedling stage.

The purple pigment manifests itself from the third seedling-leaf up to the eighth or even the tenth seedling-leaf. Leaves above this continue to be green. This manifestation is independent of whether the coleoptile is purple or green.

If this character is missed in the 25 to 35 days' stage, it could be picked up in the young side-shoots and tillers.

The authors remark that a gene designated P_{LS}, African in origin, is responsible for the manifestation of purple pigmentation in the seedlings about a month old. The local Indian sorghums lack this character and in them the seedlings remain green at this stage. P_{LS} is a simple dominant to P_{LS}.

P. P.

219. AYYANGAR, G. N. RANGASWAMI and NAMBIAR, A. K.—A new factor determining the tint of red and yellow grain colours in *Sorghum*. *The Madras Agri. Journ.*, XXVI, No. 12, (1938).

From crosses between the red colour washed *Mukkattai cholam* (*Sorghum subglabrescens* Schweinf. et Aschers. var. *rubidum* (Burkill) (Snowden) and other grain sorghums with the colours of the red, yellow and white sap colour series, it is seen that there is a definite *wash* character associated with the red and yellow sap colour series of pericarp manifestations. This *wash* factor could be superimposed on the other colours. When the basic colours are deep, the *wash* factor will naturally not show off. When the basic colour is devoid of the *I* factor for intensification and the grains are in consequence pink or light yellow in colour, the superimposition of the *wash* factor tones up these basic colours by a shade. The best manifestation of the *wash* factor is in the absence of the *W* factor disabling the expression of the other pericarp colours in wholeness and making the grain white in consequence, with the colours red or yellow confined to the base of the grain. On this white background the red wash and yellow wash show off to advantage.

A new factor designated *M* gives a red or yellow *wash* to the pericarp of the sorghum grain according as the base is red or yellow. The factor operates in the presence of *Y* or *R* factor. In the presence of the factor *W*, its expression is too faint to show out. It shows best in the absence of the *W* factor. In conjunction with the factor *I* (intensification of pericarp colour), this *wash* factor cannot be easily noted. In the absence of the *I* factor, the *wash* factor *M* slightly tones up the basic light colour.

G. N. R. A. & A. K. N.

220. BANERJI, J.—Silvicultural experiments. *Ind. For.*, LXIV (1), pp. 7–14, (1938).

The present system of 'Paired Plots' is examined and is considered unsatisfactory; if used, Fisher's *t*-method, or Mahalanobis' *f*-table should be used for computation of significance. A system of Randomized Blocks is recommended for silvicultural experiments. After analysis of variance, Fisher's *z*-table or Mahalanobis' *x*-table should be employed for testing significance of results. A plea is made out for more detailed, well laid out and complicated experiments.

J. B.

221. BEESON, C. F. C.—Undergrowth and the biological control of teak defoliators. *Ind. For.*, LXIV (8), pp. 485–492, (1938).

The value of undergrowth in the biological control of defoliators in teak plantations has been investigated and species of plants are listed which are (*a*) desirable because they are the food-plants of defoliators that are alternative hosts of parasites of *machaeralis* and *puers*, or (*b*) undesirable because they are alternative food-plants of *machaeralis* or *puers* or of other pests of teak. A statement of the distribution of identified parasites of teak defoliators is given, and experiments in the introduction and colonisation of parasites between Burma, North India and Madras are described.

C. F. C. B.

222. CAIUS, J. F.—Medicinal and poisonous plants of India: Magnoliads, Dilleniads, Anonads, Menispermads, Berberids. *Journ. Bombay Nat. Hist. Soc.*, XL, No. 1, pp. 69–95, (1938).

The author gives a list of medicinal and poisonous plants belonging to the families of Magnoliaceae, Dilleniaceae, Anonaceae, Menispermaceae and Berberidaceae. He has given a description of the habit, habitat, chemical and medicinal properties, and the use of each of the plants separately.

P. P.

223. CHATTERJEE, INDU BHUSANA and HYE, MD. ABDUL—Can Water Hyacinth be used as a cattle feed? *Agric. and Livestock in India*, VIII, Part V, pp. 547–553, (1938).

It is pointed out that hyacinth can hardly occupy a high place as a fodder.

The experiment shows that under the singular circumstances in which the country is placed, the moderate use of hyacinth as a fodder can be permissible, but in order that full benefit is derived from it, it should always be fed in combination with cake or concentrate and still better in a combination of a number of feeds.

P. P.

224. CHATURVEDI, M. D.—Cultivation of *Baib*. *Ind. For.*, LXIV (11), pp. 709–713, (1938).

The *baib*, otherwise known as *bhabar* or *sabai*, is a perennial grass of considerable economic importance for *ban*, rope and paper making industries. It occurs naturally along steep slopes on dry stiff soils where nothing else grows and there are possibilities of growing it also on *bhur* soils of the U.P. It is best propagated vegetatively by rootstocks collected from adjoining forests or from a nursery by raising local stock by seed and put out 2′×2′ (apart). Details of the nursery and plantation technique are given and it is mentioned that clear weeding and protection from animals are absolutely essential at the young stage. The grass is ready for cutting the following year and the average yield is one ton per acre producing an income of about Rs.13-8-0 per annum.

J. N. S. G.

225. CHENGAPA, B. S.—Padauk in the Andamans. *Ind. For.*, LXIV (3), pp. 151–160, (1938).

In this note the writer examines the behaviour of padauk (*Pterocarpus dalbergioides*) in the plantations of the past and also its behaviour in the natural regeneration areas of the present. Particular stress is laid upon the failures in past plantation work and the cheap and successful natural regeneration that is now being obtained.

M. V. L.

226. CHOPRA, R. N. and BADHWAR, R. L.—A note on collection and cultivation of medicinal plants. *Agric. and Livestock in India*, VIII, p. 222, (1938).

During the last 25 years a number of drugs of Indian origin have assumed importance from the point of view of foreign trade, which they did not possess before. It would appear that proper attention is not paid to the time and manner of collection of the crude drugs and their quality, therefore, is often not good. Roots, rhizomes, and bark should be collected late in autumn or early in spring; leaves usually about the time of development of flowers and before maturity of fruits; flowers prior to or just about the time of pollination; fruits when fully grown but unripe; seeds when mature. Many of the important medicinal plants that are not found in India and whose finished products or the raw materials are imported, as also those that are found in inaccessible places, could be cultivated with advantage. They should not only be grown but effort should be made to get the maximum active principles in them. Attention should be paid to (*a*) proper identification and selection of the best variety; (*b*) variation of the active principle not only in different parts of the plant but also in different stages of growth of the same organ of the plant; (*c*) seasonal variation; (*d*) climatic and altitudinal effects; (*e*) method of drying, storage. This will help a great deal in obtaining the standard and marketable product. The cultivators will obtain help in this connection from the Agricultural and Forest Departments and the Medicinal Plants and Food Poisons Inquiry. A list of 40 plants that are likely to be profitably cultivated is given. Popular names, part or parts of the plants used, their uses in medicine and commerce, and suitable localities for the cultivation of each of these are indicated.

R. N. C. & R. L. B.

227. CROWTHER, FRANK—Habit of the cotton plant and its influence on optimum date of application of nitrogenous fertilizer (with three text-figures). *Ind. Journ. Agri. Sci.*, VIII, Part V, pp. 617–628, (1938).

The movement of nutrients within the plant following fertilizer application is described from experimental work in Egypt and elsewhere, and against this background the influence of the branching habit of the chief commercial varieties of India on the optimum date of application is discussed, with the modifications introduced by local influences of soil and climate.

The late date of application, viz. during flowering, which has been established experimentally in the Punjab for irrigated American cotton is explained by modification of plant habit by excessive early fruit-shedding. The plant's morphological habit permits fruit production over a long period and suggests that the optimum date of application also extends over a period; but, since chiefly by non-dehiscence of anthers the early fruits are largely shed, much of the benefit from early applications will be lost.

The branching habit of the commercial crop of Central India suggests applications at, or soon after, sowing and this is endorsed by the influences of soil and climate.

Herbaceum cottons with their long growing season and freedom from any marked check to development through 'internal starvation' suggest an application in two doses, one to encourage early vegetative growth and another later, according to rain incidence, to sustain the protracted growth and avoid the risk of reduced response through any early fruit-shedding which may occur.

In the United Provinces and the Koilpatti district of Madras the influence of local factors is paramount, the former suffering severe Pink Bollworm damage and the latter fruit-shedding after February rains. In both cases the date of application must be so timed that the extra bolls from manuring suffer minimum loss from these adverse factors.

F. C.

228. DABRAL, B. M. and CHINEY, S. S.—A note on border effects in manurial experiments on cotton at Sakrand during 1935-36 (with one text-figure). *Ind. Journ. Agric. Sci.*, VIII, Part V, pp. 629-635, (1938).

With a view to study the effect of inclusion or rejection of border yields from the total yield of a plot, the yields from border rows and central portions of plots under manurial experiments on cotton were separately picked and weighed.

The data was subjected to statistical analysis and it was found that, with the inclusion of border yields—

(i) the percentage increase in the total yield was highest in control plots, while it regularly diminished with increasing quantities of manure in treated plots;
(ii) the standard error of the experiment was reduced, but it did not improve significances;
(iii) there was a disturbance in the mean values of the treatments, so that the significance of the best treatments was lost. Marginal effects should, therefore, be eliminated while conducting manurial experiments on cotton.

B. M. D. & S. S. C.

229. DE, R. N.—Effect of grass on teak seedlings. *Ind. For.*, XXIV (9), pp. 563-564, (1938).

As noticed in the Goalpara division (Assam), the rate of growth of sal seedlings was definitely slower in grassy areas (mostly under *Imperata*) than in clearfelled tree forests with other weeds.

J. N. S. G.

230. DESHPANDE, R. B.—Studies in Indian fibre plants, No. 5. Further studies on the inheritance of certain characters in *Hibiscus sabdariffa* L. *Ind. Journ. Agri. Sci.*, VIII, Part III, pp. 229-243, (1938).

The stem colour in *Hibiscus* may be in the form of (1) red patches, as in *altissima*, or in the form of (2) light brown flushes or washes as those in the brown phenotype realised in the F_2's of the two crosses, or (3) as deep flushes or washes as present in *ruber*.

No. (1) is due to a set of factors, *X*, *A*, *B*, and *W*, which is present in all the three varieties used as parents.

No. (2) is due to a factor, *M*, present in *albus* and *ruber* and absent in *altissima*.

No. (3) is due to a factor, *S*, present both in *albus* and *ruber* and absent in *altissima*.

The expression of any colour depends upon another factor *R*, which is present in *ruber* and *altissima* and absent in *albus*, for which reason it (*albus*) appears green even though it possesses the full quota of colour factors.

The difference between *albus* and *altissima* being of three factors, viz. *R*, *S*, and *M*, a tri-hybrid F_2 segregation (36 red : 9 brown : 3 *altissima* : 16 *albus*) for stem colour is obtained. This is supported by the F_2 and back-cross results.

The extracted green-stemmed recessive like *albus* in F_2 of the cross, *albus* × *altissima*, have been proved to be of different genetic constitution.

Ruber and *altissima* differ in two factors, viz. *S* and *M* for stem colour, and a dihybrid F_2 segregation (12 red : 3 brown : 1 *altissima*) is realized and this result is supported by the F_3 observations.

The pink colour of the faded corolla depends upon a factor *F*, which is present in all the parents. It cannot find expression in the absence of *R*. Thus in the cross, *albus* × *altissima*, with the segregation of *R* a ratio of 3 pink-fading corolla : 1 yellow-fading corolla is obtained.

Narrow leaf-lobe is found to be dominant to broad leaf-lobe on a 3 : 1 basis. This is confirmed both by the F_3 and back-cross data.

Hairiness of stem depends upon two factors, cumulative in effect, giving an intermediate F_1 and a ratio of 15 hairy (various grades): 1 non-hairy in F_2.

The results are supported by F_3 and back-cross results.

A closer affinity between *altissima* and *H. sabdariffa* than between the former and *H. cannabinus* is indicated by the results of crossings.

R. B. D.

231. DUTT, N. L., KRISHNASWAMI, M. K. and SUBBA RAO, K. S.—A note on seed-setting and seed-germination in certain sugarcanes. *Ind. Journ. Agri. Sci.*, VIII, Part IV, pp. 429–439, pl. xviii, (1938).

The seed-germinations of over forty varieties were studied for five to seven seasons. Varieties like POJ2725 gave uniformly high germinations, while *S. officinarum* varieties, such as Vellai, Chittan, etc., gave consistently low germinations. The *S. spontaneum* forms topped the list. A judicious combination of *S. officinarum* and *S. spontaneum* blood in Co419 and Co421 has resulted in these varieties, giving seed of high germinating capacity.

The attempt to improve germination by chemical means was not successful.

While a certain amount of influence of the pollinating parent was evident, the high or low germinations seem to depend more on the inherent capacity of the female parent.

The securing of desirable type of seedlings appears to be intimately connected with inter-varietal rather than inter-specific crosses.

Seeds of sessile spikelets gave more germinations than those of pedicelled ones in all the cases examined, including *S. spontaneum*.

There is a high positive correlation between the thickness of the cane and the length as also width of the seed.

N. L. D., M. K. K. & K. S. S. R.

232. GARLAND, E. A.—Indian Ephedra. *Ind. For.*, LXIV (10), pp. 593–596, (1938).

Although different species of *Ephedra* are widely distributed all over the world, yet the species which are rich in active principles have so far been found to occur only in China, India and some parts of Spain. *Ephedra nebrodensis* and *E. gerardiana* found in North-western Himalayas and transfrontier borders are sufficiently rich in ephedrine content for commercial purpose. The other species, *Ephedra intermedia*, containing more of the pseudo-ephedrine is also likely to find a market in the drug trade. Disturbed conditions in China and Spain which monopolised the market so long have offered a good opportunity to the Indian product and trade to be properly organised.

J. N. S. G.

233. GHOSE, T. P.—Trade in Indian Ephedras. *Journ. Ind. Chem. Soc. Indust. and News Edition*, 1 (4), pp. 142–145, (1938).

Although Indian Ephedras, such as *E. gerardiana* and *E. nebrodensis* are as rich as the Chinese or Spanish Ephedras in ephedrine content, it was only during the acute shortage of supplies from these countries, in March and April 1938, that large quantities of Indian Ephedras were imported into America and the European countries. It has been emphasised that this advantageous trade position should be maintained by exporting the drug of uniform and rich quality. To achieve this, care should be taken to collect only the rich species from proper localities at the proper season.

T. P. G.

234. **GORRIE, R. M.**—Crown ratio in Indian conifers. *Ind. For.*, LXIV (2), pp. 101–104, (1938).

Reports recent Australian work on the use of crown ratio (i.e. ratio of diameter at breast height to the average crown width) as a guide to spacing in thinnings, and discusses its application to Himalayan conifer crops. A critical note by Laurie follows, pointing out some difficulties in the simple direct application of crown ratio to determine spacing in thinnings.

M. V. L.

235. **GORRIE, R. M.**—Stone bunds in erosion control. *Ind. For.*, LXIV (3), pp. 149-150, 5 pls., (1938).

Describes the wrong and right ways of constructing rough stone bunds for control of gullying, special note being made of the best spacing and proper contouring of the top of the bunds.

M. V. L.

236. **GRIFFITH, A. L.**—An investigation into the best root length of stump to use when stump planting teak (*Tectona grandis*) in areas having a West Coast type of climate. *Ind. For. Rec.*, (S), III (1), pp. 1–15, (1938).

The investigation which consisted of 11 experiments conducted at four centres over a period of four years (1932 to 1935) shows that from a consideration of the survival percentage and mean height growth at the conclusion of the first growing season after planting, there are no appreciable differences in results from stumps within the root range of 6″ to 10″ but that a root length of 4″ gives definitely poorer results. (A stump is a root and shoot cutting made from a 1-year-old nursery seedling.)

The investigation also shows that stumps of 0·7″ to 0·8″ diameter give appreciably better results than those of 0·3″ to 0·4″ diameter.

The experiments were done in places having a general West Coast type of climate with an average annual rainfall varying from 60″ to 120″ and at elevations varying from the plains up to 3,000 feet. The soils at all centres are light forest soils naturally well aerated.

A. L. G.

237. **GRIFFITH, A. L.**—An investigation into the best date of stump planting teak (*Tectona grandis*) at Begur (Wynaad Division), Dhoni (Palghat Division) and Topslip (South Coimbatore Division). *Ind. For. Rec.*, (S), III (2), pp. 17–46, 2 pls., (1938).

Of the three localities under reference, the first and the third are at an elevation of about 2,000 ft., with an annual average rainfall of 67″, while the second is in the plains with 111″ rainfall. In all these places, the south-west monsoon actually breaks in June with pre-monsoon showers in April and May. These showers are, however, more variable at Topslip than at the other two places. Experiments have so far proved that the best time of stump-planting teak is the middle of April at Begur and Dhoni and early May at Topslip,—resulting in 40 to 80% increase in height growth (apart from relatively good stocking) over normal early June planting.

J. N. S. G.

238. **GRIFFITH, A. L.**—An investigation into the relative merits of planting teak (*Tectona grandis*) stumps in pits and in crowbar holes in areas having a West Coast type of climate. *Ind. For. Rec.*, (S), III (3), pp. 47–59, (1938).

The investigation which consisted of 11 experiments conducted at five centres over a period of three years (1932 to 1934) shows that from a consideration of the survival percentage and mean height growth at the conclusion of the first growing season after planting, there are no appreciable differences in results from teak stumps planted in pits from those planted in crowbar holes. As pitting is much the more expensive method of soil preparation for planting it is thus not economically justified. (A 'stump' is a root and shoot cutting made from a 1-year-old nursery seedling.)

The experiments were done in places having a general West Coast type of climate with an average annual rainfall varying from 60″ to 120″ and at elevations varying from the plains up to 3,000 feet. The soils at all centres are light forest soils naturally well aerated.

A. L. G.

239. HEDAYETULLAH, S. and ROY, K. P.—A note on the experiment to investigate into the effect of dusting paddy plants with paris green powder on the yield of grain and straw. *Science and Culture*, III, No. 7, pp. 401-402, (1938).

That the fall in the yield of grain due to dusting with paris green is wellnigh 20% on the whole. This is tentatively due to interference of the powder on the proper growth and development of the grains.

That the deleterious effect is positively patent and independent of the time of dusting.

That there is practically no effect of dusting with a 2% paris green on straw, healthy as reported by Nicholls (*Ceylon Journ. Sc.*, Sect. D. 11, 1, pp. 21, 30, 27) or harmful, as is clearly evident from the absence of any absolute difference in yield either in favour or against the treatment. Moreover, no trace of apparent deleterious effect of the powder on the green leaves was noticed.

S. H. & K. P. R.

240. HUSSAIN, M. T.—Regeneration of Semal (*Bombax malabaricum*) from root suckers. *Ind. For.*, LXIV (7), pp. 396–400, (1938).

Results of experiments in trenching round stumps of *Bombax malabaricum* trees showed that regeneration by root suckers can be obtained by cutting or bruising large lateral roots of standing trees or of freshly felled stumps. Cutting their roots far away from the tree did not give good results. Fencing against deer was found essential for the survival of the root suckers. The average height growth in the first season was about 5 feet.

M. V. L.

241. HUSSAINY, S. A.—Technique of sugarcane × bamboo pollination. *Current Science*, VII, No. 5, p. 232, (1938).

The difficulty of getting fresh bamboo pollen at Coimbatore Sugarcane Station for hybridising the sugarcane with bamboo is got over by planting bamboo stumps at the sugarcane station, after the flowering clumps are cut off. Such stumps put forth inflorescences for fairly continuous periods.

P. P.

242. HUTCHINSON, J. B., RAMIAH, K. (and the Members of two Special Sub-Committees)—The description of crop-plant characters and their ranges of variation. I. The variability of Indian Cottons. II. Variability in rice. *Ind. Journ. Agric. Sci.*, VIII, Part V, pp. 567–616, (1938).

The authors emphasise the necessity of a complete co-ordinated descriptive study of the taxonomy of crop plants throughout India. As such it is considered that the above study is only possible by the description of certain characters in each crop plant rather than the types themselves, and that the publication of such records can best be in the shape of standardised tables and schedules. Under the study of the variability of the Indian cottons the 3 species *G. arboreum*, *G. herbaceum*, and *G. hirsutum* were described and the method of describing the different parts of the plant was also given. In rice also different species of *Oryza* are studied. The material, characters, genetics and gene symbolisation are described for the guidance of the workers in rice.

P. P.

243. **Hutchinson, J. B., Panse, V. G., Apte, N. S. and Pugh, B. M.**—Studies in plant breeding technique. III. Crop analysis and varietal improvement in Malvi jowar. *Ind. Journ. Agric. Sci.*, VIII, Part II, pp. 131–152, (1938).

The present status of *jowar* in Central India has been surveyed and the possibilities of crop improvement by the selection studied.

Snowden's classification is shown to be inadequate to the needs of agricultural botany. The *jowars* of Central India are assigned to one of his main groups (*Sorghum durra* Stapf), and it is shown that the limits of at least three of his species in this group are transgressed in the single, variable, inter-breeding crop-population.

Results of a crop analysis carried out in Malwa and Nima are described and compared with those obtained from a similar study on cotton by Hutchinson and Ghose.

Two years' mass selection had no appreciable effect on the yield of Malvi *jowar*.

Progeny row work was carried out in replicated randomised blocks as described by Hutchinson and Panse. Large and highly significant differences in yield between progenies were demonstrated in each season and three strains, one significantly superior to the local in yield and the other two of considerable promise, were isolated. It is suggested that the plant breeder should endeavour to retain as wide a range of material as possible in 'small bulks' trials to improve his chances of discovering some strains superior under all environmental conditions.

J. B. H , V. G. P., N. S. A. & B. M. P.

244. **Hutchinson, J. B., Panse, V. G. and Govande, G. K.**—Studies in plant breeding technique. IV. The inheritance of agricultural characters in three Inter-strain crosses in cotton. *Ind. Journ. Agric. Sci.*, VIII, Part VI, pp. 757–775, (1938).

Three strains of *G. arboreum* var. *neglectum* were crossed in all three possible ways, and parents, F_1's and F_2's grown in the same year in a ten-block randomised progeny row experiment.

Analyses of variance were carried out on plot values for germination, node number, *kapas* yield, staple length and ginning percentage. Strong heterosis was demonstrated in all characters, the F_1 differing from the mean of the parents, and the F_2 usually falling between the F_1 and the mean of the parents. The direction of the heterosis bias was in all cases that which would be expected if heterosis was due to effects of selection. In node number the bias was towards a low number, and in other characters towards high values.

The importance of dominance and epistasy as causes of heterosis is discussed. The present data do not distinguish between the two, but it is pointed out that both may be expected to result from the action of selection.

Differences between F_2 progenies from sister F_1 plants demonstrated the existence of genetic variance within the parental strains. Its distribution was as would be expected if selection is more efficient than random elimination of genes in reducing genetic variance.

Within-plot variances were calculated for node number, *kapas* yield, staple length and ginning percentage. An adjustment was made for block differences and in staple length this resulted in a reduction in variance of from 15 to 31 per cent. Even after the adjustment it is concluded from the ratio of F_2 to F_1 variances that the environmental contribution remained a very high proportion of the total variance. Single plant selection in progeny rows is therefore likely to be inefficient, and estimates of within-plot variance of low value for genetic studies.

From the within-plot variances in F_2 it is concluded that Malvi is more closely related to Bani (forma *indica*) than to C 520 (forma *bengalensis*).

J. B. H., V. G. P. & G. K. G.

245. **Hutchinson, J. B. and Nath, Bhola**—A note on the occurrence of chlorophyll deficiency in *Gossypium arboreum*. *Ind. Journ. Agric. Sci.*, VIII, Part IV, pp. 425–427, (1938).

A chlorophyll-deficient seedling type is described which appeared in a cross between Malvi 9 and a *cernuum* type. Chlorophyll-deficient is shown to be a simple Mendelian recessive to green. No symbol is given to the gene, pending tests of homology with

Ramanathan and Balasubramanyan's (1937) types. The origin of the gene is traced to mutation in the Malvi 9 parent.
J. B. H. & B. N.

246. KADAM, B. S. and KULKARNI, R. K.—Genetic improvement of wheat, in Bombay. I. Bansipalli-808. *Agric. and Livestock in India*, VIII, p. 376, (1938).

The paper describes agronomic and botanical features of a new wheat, Bansipalli-808, produced by hybridisation from a cross between an improved wheat, Bansi-168 and a synthetic variety, Khapli-568. It has white glumes and awns and the grains are larger with more attractive yellow colour and lustre. Bansipalli-808 is earlier by about a fortnight to the local wheat of the Deccan. As a non-irrigated wheat it is spreading in Nasik and Ahmednagar districts of the Deccan and in the wheat tract of Karnatak. It is susceptible to black stem rust of wheat and is slightly difficult to thresh.
B. S. K. & R. K. K.

247. KADAM, B. S. and KULKARNI, R. K.—Genetic improvement of wheat in Bombay. 2. Bansi-168 and Bansi-224. *Agric. and Livestock in India*, VIII, pp. 675–682, (1938).

1. Two improved strains of wheat Bansi-168 and Bansi-224 selected in 1918-19 by Chibber from local Bansi (*T. durum* Desf.) of Bombay are described.
2. Bansi-168 is now a standard strain in the West Khandesh district, is earlier by ten to twelve days than Local with more attractive lighter coloured grain than Local and even Bansi-224.
3. Bansi-224 has proved suitable to the Bhal tract of Gujarat and to the East Khandesh district. It ripens a week later than Local. The grains are longer with reddish tinge and oily appearance. This lustre and uniform size fetches a premium.
4. Both the wheats are susceptible to black stem rust.
B. S. K. & R. K. K.

248. KAMESAM, S.—Standardisation of treated wood pole sizes for overhead electrical transmission supports. *Ind. For.*, LXIV (1), pp. 43–48, (1938).

Gives tables of dimensions and strength data for wooden poles classified into three strength categories, with lists of Indian species belonging to each category.
M. V. L.

249. KAPUR, C. L.—Protection of *Prosopis juliflora* pods. *Ind. For.*, LXIV (4), p. 239, (1938).

Pods of *Prosopis juliflora* that is infected with the early invisible stages of the weevil *Caryoborus gonagra* are destroyed even if stored in dry sand in airtight tins. Preliminary fumigation is advised to kill the weevils.
M. V. L.

250. KHANNA, K. L.—A hypodermic syringe for use with hand refractometer in sugarcane. *Ind. Journ. Agric. Sci.*, VIII, Part V, pp. 719–726, pl. lvii, text-fig. 1, (1938).

The instrument designed is a radical improvement over other devices used for taking juice sample from growing cane-stalks without in any way spoiling them for future readings to be taken during the course of ripening and possesses the following advantages, namely:—

(i) minimizes the actual rupturing of cells and permits of purer juice sample being drawn by suction;
(ii) enables the sample of juice drawn to drop on the refractometric prism easily by pressure;
(iii) enables one to get over the difficulty of having to clean the needle point every time it is used; and by having a number of removable piercing points to suit canes of different rind hardness and other special purposes such as intensive study on a particular internode, etc.;

(iv) it makes both the experimental as well as the large scale field testing an easier task. With little practice an observer soon masters the technique and can go over a much larger population than hitherto possible in a day.

K. L. K.

251. KRISHNA, S. and T. P. GHOSE—Indian *Tephrosia* sp. as a source of rotenone. *Current Science*, VI, No. 9, p. 454, (1938).

Root bark of *Tephrosia candida* has been found to contain 0·35% and the seeds 0·5% of rotenone. The leaves also contain rotenone as indicated by colour test. Root bark of *Tephrosia purpurea* showed presence of rotenone (less than 0·3% colour test positive).

S. K. & T. P. G.

252. KUMAR, L. S. S. and JOSHI, W. V.—A white flowered type of *Arachis hypogaea* Linn. *Current Science*, VI, No. 9, pp. 454–455, (1938).

A single plant bearing white flowers was noticed by the authors in 1934. In 1935 sixteen plants were raised from selfed seeds. Out of these 14 had white flowers and 2 bore orange yellow flowers. In 1936 it was observed that the plants from the selfed seeds behaved true to their parental character for flower colour. The white flowered type which has been bred for three generations continues to breed true. In the present state it is difficult to explain why the 2 orange flowered progenies appeared from the white flowered plant or why the progenies continue to breed true without any of them segregating for that character. The authors are trying to find out the possible origin of the white flowered type.

P. P.

253. LANDER, P. E., NARAIN, RAMJI and SINGH, AZMAT—Soil-uniformity trials in the Punjab. *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 271–307, 7 text-figs., (1938).

The yield data from four soil-uniformity test crops grown at the Rawalpindi Agricultural Station have been presented and considered in a number of ways.

For the purpose of a uniform basis of comparison the individual plot yields, wherever necessary, have been adjusted by multiplying them by suitable factors so as to give the same average yields for different crops grown in different years, and these results have then been plotted in the form of curves which show at a glance the comparative behaviour of each plot under different crops in different seasons.

Fertility contours indicating soil fertility at different places have also been drawn on lines similar to those adopted by the Meteorological Department in representing weather phenomena at various places.

The conclusions arrived at from a consideration of these curves and contour maps have been confirmed by the determination of coefficients of variability, and by the analysis of variance.

It has been shown that in the case of annual crops the precision of the experiment does not increase appreciably by the application of the method of covariance.

The available data have also been examined by considering the entire area as one compact block of twenty-five plots (5×5 Latin square). It has been shown that the experimental error can be considerably reduced by adopting suitable methods of layout.

Two forms of soil heterogeneity are recognised, viz. casual and permanent. The trials have shown that casual fertility may vary with the crop and season, while permanent fertility is independent of such factors and maintains its level under all conditions.

Soil heterogeneity as revealed by any one crop cannot be a true index of the subsequent behaviour of that area with respect to the same or other crops. The value of uniformity trials in deciding the best form of layout for field experiments to be conducted during subsequent seasons is, therefore, limited.

P. E. L., R. N. & A. S.

254. LAURIE, M. V.—A rough guide to thinning teak based on average spacing for a given mean diameter. *Ind. For.*, LXIV (7), pp. 397–398, (1938).

Yield table data for teak indicates that the average spacing in feet is roughly 1·3 $(d+3)$ where d is the mean crop diameter in inches. Assuming minimum espacement to be two-thirds of the average espacement a rough guide for thinning teak is that no two trees should be left closer together than ($d+3$) feet, d being the diameter in inches of the tree it is desired to retain. It is suggested that this formula may be a simple and useful guide in thinnings of unevenaged teak forests.

M. V. L.

255. LAURIE, M. V.—Germination of Nim seeds (*Azadirachta indica*). *Ind. For.*, LXIV (8), p. 500, (1938).

Reports that very successful and abundant germination of *nim* (*Azadirachta indica*) has always been obtained in one range in Madras by using only seed, white in colour, that was collected from beneath *Ficus* and other trees on which crows were wont to sit and eat *nim* seeds.

J. N. S. G.

256. LAURIE, M. V.—Branching and seed origin in Coorg teak plantations. *Ind. For.*, LXIV (10), pp. 596–600, 5 pls., (1938).

Four different types of branching seen in Coorg teak plantations are described and illustrated and the probability of their being due to hereditary factors discussed. It appears that varieties arising from seeds from dry localities may have considerably exaggerated characteristics when raised in damper and more favourable conditions. The necessity for ascertaining that the seed comes from a good origin when making teak plantations is emphasised.

M. V. L.

257. MACALPINE, R. I.—Mixture of species in plantations. *Ind. For.*, LXIV (9), pp. 574–583, (1938).

The difficulty in standardising mixtures in terms of rotation, uses, locality, etc., is emphasised. From the provisional data collected, two curves B.H.G./Age were drawn to show ages at which various Bengal species might be expected to attain 6′ girth over bark. Of the several methods of mixture in plantations experimented with the more practicable ones appear to be: (1) alternate groups of strips, (2) alternate lines, (3) mixed seed sowings in lines, and (4) quincunx—No. (1) being the most promising. Their details and the principles underlying such mixtures have also been discussed.

J. N. S. G.

258. MITCHELL, J. E. M.—Note on Sandal regeneration. *Ind. For.*, LXIV (9), pp. 541–551, (1938).

Sandal is usually found on rocky and gravelly soils in open scrub forests, hedge rows, lantana bushes and bamboo clumps in Coorg, Mysore and some districts of Madras and Bombay Presidencies between elevation of 2,000 ft. to 4,000 ft.. For its proper development the sandal tree depends upon the host trees. Sandal can be raised successfully and at a profit in plantations in semi-evergreen forests, either by clearfelling compact areas (leaving about 20 standards per acre as hosts) or in 12 ft. vide strips at intervals of 50 ft., burning the slash and sowing seed at 12 ft. intervals with subsequent weeding operations as required. *Cassia siamea*, a good host plant, may also be usefully sown along with sandal.

J. N. S. G.

259. MOHAN, N. P.—Twisted fibre in *Pinus excelsa*. *Ind. For.*, LXIV (8), p. 501, (1938).

Although twisted fibre is well known in *Pinus longifolia*, *P. excelsa* and deodar are also not immune from it as noticed in some timber depots of the Punjab.

J. N. S. G.

260. NANDI, H. K. and BASU, J. N.—Structure and development of jute fibre and the factors determining yield and quality. *Science and Culture*, III, No. 7, pp. 399–401, figs. 5, (1938).

The authors remark that the yield length and degree of fineness of fibre are dependent on the genetic constitution of the varieties modified by environmental conditions. The colour and strength of the fibre are due to the extent of the presence of lignin and subsequent treatment of the fibre during the process of retting, washing and drying. Retting is merely the destruction of soft parenchymatous tissues by bacteria and this again is dependent on the age of the plant, temperature of the retting water, stagnancy and presence of matter in the water.

P. P.

261. NARAIN, RAMJI and SINGH, AZMAT—A study of factors influencing the extraction of juice from sugarcane. *Ind. Journ. Agric. Sci.*, VIII, Part V, pp. 699–717, (1938).

In comparing different varieties of sugarcane with each other or in judging the effect of different kinds of treatments on the quality of cane, it is essential that the juice percentage, which a variety is capable of yielding, be determined accurately. This is all the more necessary when the data from the analysis of juice are to be expressed as percentages on cane. The amount of juice obtained depends not only upon the type of cane crushed but also upon certain other factors which prevail during crushing. Three such factors, viz.: (*a*) setting of the mill, (*b*) speed of the working bullocks, and (*c*) the amount of feed, are considered. In order to bring into prominence the influence exerted by these factors individually or in their various combinations upon the extraction of juice, the samples for the purpose of this investigation were drawn from a population consisting of canes as uniform as possible.

The investigation was planned on the lines of a factorial design in agricultural field trials and four replications were provided for each treatment combination. The results from four samples of canes of both the thin and the medium varieties obtained from Gurdaspur are reported and the data pertaining to each examined statistically. It was found that the effects of the main treatments were significant in almost all cases. Slow speed of working bullocks invariably yielded a significantly higher extraction of juice than the fast speed. Only in the case of the thinner varieties, viz. Katha and Co 285, extra tight setting gave a significantly higher percentage extraction than tight setting. There was no difference in the case of Co 213 but with Co 312, the thickest sample examined, it rather depressed the juice percentage significantly. The effects of feed, however, were even less consistent. It was found that for both the thin as well as the medium canes, medium feed gave the largest amount of juice. There was, however, an equal choice for the medium and heavy feeds in the case of Katha and for the medium and light feeds in the case of Co 213 and Co 312. In the case of Co 285, however, the medium feed differed significantly from both the light and the heavy feeds.

The interaction of speed and setting was found to be insignificant throughout. Feed whether in combination with speed or setting interacted significantly in most of the cases.

R. N. & A. S.

262. PAL, B. P.—Problems of potato breeding in India. *Agric. and Livestock in India*, VIII, pp. 388–396, (1938).

The present position of potato breeding is briefly reviewed and reference is made to recent potato breeding work in Europe and America. The problems of potato breeding in India are then discussed. Stress is laid on the importance of breeding varieties resistant to the early and late blights and to the various virus diseases. The problems of dormancy, frost, photoperiodism, etc. are also referred to.

An account is given of the potato breeding experiments recently initiated in Northern India. The imported and indigenous material available for this work is described as also the raising of seedlings from true seeds.

B. P. P.

263. PAL, B. P. and ALAM, NEK—The effect of certain external factors upon the manifestation of hybrid vigour in wheat. *Proc. Ind. Acad. Sci.*, VII, No. 3, Sec. B, pp. 109–124, (1938).

Hybrid vigour was studied in a cross between two varieties of *Triticum vulgare*, viz. Pusa 52 and Pusa 165, under different dates and times of sowing, different depths of sowing and different conditions of spacing. Although the cross did not show the striking effect that has made hybrid vigour notable in maize, it clearly displayed the phenomenon. There was no significant difference between the reciprocals under any of the treatments studied.

In total germination the F_1 was not superior to the parental varieties except when sowings were made at depths of 4–6 inches.

Both the time and depth of sowing, however, considerably affected the rate of germination. The increases (per cent) of the F_1 over the better parent for morning, noon and evening sowings were 6·7, 9·5 and 14·5, and for 1-inch, 3-inch and 5-inch sowings, 5·1, 8·9 and 12·5 respectively. The differential response to sowing at different depths was still more conspicuous in the case of sowings made late in the season.

Manifestation of hybrid vigour in respect of the rate of formation of the first four foliage leaves and the first tiller was affected by all the external factors under study. The difference between the F_1 and the better parent (in favour of the former) varied from as much as 20·5 per cent to nil.

Height counts (main stems only) showed that the differences between the F_1 and the better parent were significant in four out of five groups of sowings and indicated the occurrence of heterosis in respect of this character. If, however, the height of all the tillers per plant was considered the differences were insignificant. Sowing at different depths and spacings did not produce any differential response in respect of this character.

The difference in tillering between the F_1 and the better parent was more striking in the earlier than in the later sowings, the percentage increase in favour of the F_1 varying from 46·2 to nil. There were some indications that sowing at different depths and spacing exercised an influence on this character, but the effect of season appeared to be relatively unimportant.

The influence of the external factors studied on number of leaves per plant was similar to that on tillering.

In respect of ear characters there were no significant differences between the F_1 and the better parent, although the former in all cases exceeded the average of both the parents.

In early sowings the F_1 was significantly better than the higher yielding parent.

The data presented indicate that the expression of heterosis is greatly influenced by various external factors. The desirability of investigating hybrid vigour under as wide a range of conditions as possible is pointed out.

B. P. P. & N. A.

264. PARKER, R. N.—Experiments with exotics. *Ind. For.*, LXIV (12), pp. 717–723, (1938).

The term 'exotic' has never been satisfactorily defined. There are some who do not believe in the introduction of any exotics, while others consider them all right for horticulture and agriculture but not so for forestry, overlooking the fact that exotics like *Casuarina*, mulberry and *Eucalyptus* sp. have long been successfully naturalised in many parts of India. Aimless experimenting is deprecated; while the main considerations should be (1) that the exotic species has some quality such as rapid growth, valuable timber, ease of cultivation, etc., giving it an apparent advantage over the indigenous plants; (2) that it comes from as similar a climate as possible; (3) that something is known of its silvicultural requirements; and (4) that the first trial should be on a small scale and in an accessible locality.

J. N. S. G.

265. PUNTAMBEKAR, S. V.—Commercial possibilities of a new detergent and some related lauryl Compounds. *Ind. Chem. Soc., Indust. and News Edition,* (C) I (1 and 2), pp. 19–24, (1938).

The ideal detergent properties of sodium lauryl sulphate and the important uses of some related lauryl compounds are described and a suggestion is made that lauric acid, the basic material for the manufacture of these valuable compounds, could be more profitably obtained from the fats of several indigenous *Actinodaphne* and *Litsaea* spp. (Fam. **Lauraceae**) than from coconut and palm kernel oils. Physical and chemical constants of the fats from the berries of *Actinodaphne hookeri*, *A. augustifolia*, *L. chinensis*, *L. zeylanica*, *L. citrata* and *Cinnamomum camphora* are given in a tabular form.

S. V. P.

266. PUNTAMBEKAR, S. V.—Vegetable tallow. *Ind. Chem. Soc., Indust. and News Edition,* (C) I (4), pp. 163–170, (1938).

In view of their plentiful supply from the forest seeds of India and their similar chemical and physical properties, which are given in a tabular form, to a wholly imported tallow of commerce, the following fats are recommended for use as vegetable tallow in textile mills, for soap manufacture, etc.: (1) Piney tallow from the seeds of *Vateria indica*, (2) *Bassia butyracia*, *B. latifolia* and *B. longifolia*; Borneo tallow or 'Sal' butter from the seeds of *Shorea robusta*; garcinia tallow from the seeds of *G. indica*, *G. morella* and *G. cambogia*; and Chinese vegetable tallow from the fruit of *Sapium sebiferum*. Figures are given for their approximate annual output.

For the economic production of vegetable tallow from the powdered seeds of the above-mentioned species its extraction with a volatile solvent like petrol is considered to be most suitable for the purpose. Suggestion is made to establish solvent extraction plants at suitable centres, namely Bombay, Nagpur, etc.

S. V. P.

267. RICHHARIA, R. H. and KALAMKAR, R. J.—Green-seeded gram (*Cicer arietinum* L.) in Central Provinces. *Current Science*, VII, No. 6, p. 282, (1938).

A new type of gram with variable grades of green coloured seed-coat was noticed in the C.P. The seeds obtained bred true in respect of the various grades of green seed-coat. The chromosome counts were made from the root-tip cells which showed $2n = 16$.

P. P.

268. SABHARWAL, L. R.—Twisted fibre in *Pinus excelsa*. *Ind. For.*, LXIV (3), pp. 185–186, 1 pl., (1938).

The occurrence (rare) of twisted fibre in *Pinus excelsa* is reported and illustrated by Dr. Gorrie.

M. V. L.

269. SABNIS, T. S.—Albinism in mustards. *Current Science*, VII, No. 6, p. 285, (1938).

The author notes the occurrence of a few albinatic plants in one strain of the lines of *Brassica Napus*. The cotyledons in these plants are normal and green while the subsequent leaves are completely albinatic. The plants are very delicate.

P. P.

270. SALAMAN, R. N.—The present state and future development of potato breeding. *Ind. Journ. Agric. Sci.*, VIII, Part II, pp. 119–129, (1938).

The author traces the history of economic potato culture which was broadly divided into 4 periods. The author points out that certain physical characters of the tuber and the haulm, and some other physiological characters are in process of being lost. Further, he suggests that in the course of three centuries nothing has been added to the sum total of the potato's potentialities and discarded for ever are about one hundred genic factors. He concludes that effective potato breeding has almost come to a standstill. The author demonstrated resistance to blight in two species, *Solanum- Edinense* and *S. demissum*. In conclusion the author urges making an united effort to improve in the not-distant future the potato stock with all the economically desirable qualities found today in the domestic stocks and at the same time endow them with a resistance to the majority of the diseases to which the present varieties are susceptible.

P. P.

271. SAWHNEY, K.—A survey of the cotton crop of Hyderabad State. *Agric. and Livestock in India*, VIII, pp. 629–642, (1938).

A botanical survey of the cotton crop of Hyderabad State has been carried out in order to enable the Government to define its policy of cotton improvement for each tract and to provide material for the systematic improvement of the types growing therein. Much other useful information regarding the cultivation of the crop has also been collected.

The varietal composition of the crop of each district is tabulated and variations in the percentage occurrence of the principal botanical types are shown graphically.

The high relative occurrence of a botanical type in a particular area is due to its inherent suitability to the tract or is the result of a special demand for its produce. It has been found that in response to a trade demand for high ginning types, a large influx of short-staple *neglectum* (*G. arboreum* L. var. *neglectum* Watt forma *bengalensis* H. & G.) varieties, more specially *rosea* (*G. arboreum* L. var. *neglectum* Watt forma *bengalensis* H. & G.), has taken place from Berar and Khandesh into western Marhatwadda. The differences in the quality of the crop of localities in this tract are proportional to the degree of invasion by the inferior varieties. In eastern Marhatwadda Hyderabad Gaorani, *G. indicum* Lamk. (*G. arboreum* L. var. *neglectum* Watt forma *indica* H. & G.) forms the major component of the crop. The notification of this part as a Protected Area has maintained this valuable variety in continued cultivation. In Karnatak a quick maturing type of *G. herbaceum* L. var. *frutescens* Delile forms the bulk of the cold weather crop, whereas *G. neglectum* Tod. var. *cutchica* (*G. arboreum* L. var. *neglectum* Watt forma *bengalensis* H. & G.) predominates in the early sown cotton. Upland American (*G. hirsutum* L.) is grown pure in light, well-drained soils of Karnatak as well as Marhatwadda and it forms an appreciable component (15 to 30 per cent) of the general crop in the Gaorani Protected Area. The occurrence of the American variety is due to the introduction of acclimatised seed from Dharwar into Raichur District and from Central Provinces and Berar into east Marhatwadda.

In the greater part of Telingana the crop is not of much importance. In Karimnagar and the northern half of Warangal district *G. indicum* Lamk. forms three-fourths of the mixed crop and *neglectum* varieties the remainder. In Adilabad *neglectum* types constitute about sixty per cent of the crop and the balance is made up of *G. indicum*. The crop of Nalgonda and southern half of Warangal district is similar in composition to that of the adjoining parts of the Madras Presidency and has *G. obtusifolium* Roxb. var. *Coconada* (*G. arboreum* L. var. *typicum* H. & G. forma *indica* H. & G.) as its principal component.

A collection of true-breeding botanical and agricultural types has been built up to serve as a nucleus for further improvement work.

P. P.

272. SAYER, W. and SEN, S.—Manurial experiments with sulphate of ammonia and nitrate of soda on sugarcane. *Agric. and Livestock in India*, VIII, p. 165, (1938).

From a series of field experiments, the authors find that nitrate of soda produces an insignificant higher tonnage yield in sugarcane than sulphate of ammonia, but a marked increase through double dressing and manuring before the monsoon. The significance of these fertilizers from an economic point of view is also discussed.

W. S. & S. S.

273. SETHI, R. L., SETHI, B. L. and MEHTA, T. R.—Inheritance of earliness in United Provinces rices. II. *Ind. Journ. Agric. Sci.*, VIII, Part I, pp. 1-20, 1 pl., 1 text-fig., (1938).

The results of a study of earliness made in four rice crosses with *sathi* rice as one of the parents have been described. Data up to the F_6 generation have been presented. The frequency distribution of flowering duration in F_2 was continuous and extended from the lower extreme of the early parent to well beyond the upper extreme of the later parent. The F_2 durations tended to be reproduced in the F_3 generation, although environmental influences exercised considerable control over the flowering of certain plants. The standard deviations of the flowering durations of the different F_2 families did not exhibit any relation to the corresponding mean values. The inheritance was governed by several cumulative genes. There was a rapid increase in homoxygosity till in the F_6 generation almost all the hybrid cultures had become 'pure'.

R. L. S., B. L. S. & T. R. M.

274. SINGH, B. J.—Nim. *Ind. For.*, LXIV (12), p. 743, (1938).

Seed collected from under *nim* trees and not from beneath *Ficus* or other trees has consistently given good results in the *rab* regeneration of the fuel coupes of Guntur forest division (Madras).

J. N. S. G.

275. SINGH, B. N., CHAKRAVARTI, S. C. and KAPOOR, G. P.—An interspecific *Hibiscus* hybrid. *Journ. of Heredity*, XXIX, No. 1, pp. 37–41, 4 figs., (1938).

In order to determine the interspecific crossability of different species of *Hibiscus* the authors grew and crossed a number of species of *Hibiscus* with one another. Of the several crosses made hybridization between *H. esculentus* and *H. ficulneus* was alone found to be successful. The F_1 hybrids differed from their parents in several characters. The relationship between the parents and hybrid, as summarized by the author, is as follows:—

A. Characters new in the hybrid:
   1. Increased height, branching (Figures 15-16) and number of fruits borne (Figure 14).
   2. Presence of two pairs of stipules.
   3. Sterility.

B. Characters intermediate:
   1. Stem colour.
   2. Number and size of epicalyx.
   3. Size of the fruit.
   4. Dehiscence of the fruit (Figure 15C).
   5. Time of flowering.

C. Characters like the parent *H. esculentus*:
   1. Compact stigma head.

P. P.

276. SINGH, LAL and SINGH, SHAM—Pruning of fruit trees. The effect of dormant pruning on cropping and vegetative vigour of *phalsa* (*Grewia asiatica*). *Ind. Journ. Agric. Sci.*, VIII, Part III, pp. 319–330, pls. xi–xiii, 1 text-fig., (1938).

The heading of *phalsa* bushes to the base in winter is most commonly practised by *phalsa* growers in the Punjab. This widely adopted method of pruning is, for convenience of reference, termed 'severe pruning'.

The various degrees of dormant pruning tried are: (*a*) 'severe pruning', i.e. cutting the bushes at level with the ground in winter, (*b*) 'moderate pruning', i.e. heading the bushes at a height of 1½-2 feet above ground and allowing new growth to take place on the frame-work thus provided, and (*c*) 'light pruning', i.e. heading the bushes at a height of 3½-4 feet above ground, thus providing a bigger frame-work than in the case of the moderately pruned bushes.

Some investigations into the effect of pruning, carried out over a period of six years, show beyond doubt that light pruning of bushes is the best.

The high positive correlation between the number of shoots produced and the yield shows that there is a very close association between them. This point has a practical importance in that increased returns can be obtained by inducing more new growth which can be effected by adopting suitable pruning methods in orchard practice.

Other conditions being equal, the severer the pruning in the case of *phalsa* bushes (*a*) the less the amount of crop, (*b*) the less the number of new shoots, and (*c*) the quality of fruit is worse, but the size of the fruit is greater.

L. S. & S. S.

277. SINGH, LAL and LAL, GIRDHARI—Studies in the preservation of fruit juices. I. Some observations on the preparation and preservation of citrus fruit squashes. *Ind. Journ. Agric. Sci.*, VIII, Part I, pp. 77–102, pl. vi, (1938).

On the basis of analysis of samples of eighteen different brands of citrus squashes available in the market, various sets of orange and lemon squashes with different sugar concentrations (35°, 45° and 65° balling strength) preserved by different methods of preservation, were prepared and stored at room temperature for a period of 1½ year. Their behaviour during storage has shown that:—

Citrus fruit squashes with high sugar content (65° B) retain their fresh-fruit character and stability to a marked degree.

Addition of thoroughly ground and strained peel emulsion of two to four per cent fruits used for juice extraction considerably improves the flavour and aroma of the bottled product.

Preservation with sulphur dioxide yields a product superior in taste, flavour and odour to that preserved with sodium benzoate or Pasteurization.

For effective preservation, maximum permitted concentration of sulphur dioxide (350 p.p.m.) can be fairly diminished (100–200 p.p.m.) in squashes with high sugar content.

An examination of samples of squashes occasionally opened and re-corked during summer has shown that the chemically preserved squash has far better keeping qualities than the Pasteurized squash.

Squashes other than those preserved with sulphur dioxide undergo marked colour changes (light, yellow to deep brown) in 1¼ year's storage.

Method of preparation and standardization of orange and lemon squashes has been given, their recipes and cost of production have been worked out.

L. S. & G. L.

278. SINHA, J. N.—A note on laurel wood (*Terminalia tomentosa*) and its market in Great Britain. *Ind. For.*, LXIV (11), pp. 669–674, (1938).

'Figured' laurel is much fancied in England. India at present supplies a quantity and the market is expanding. But 'figure' partakes so much of sentiment that it is hard to define. It is harder still to tell if any given log would yield 'figured' timber, and ordinary laurel wood is not cared for. In this article the opinions of certain British brokers and merchants are pooled and hints for exporters are given.

J. N. S.

279. SMYTHIES, E. A.—The Taungya plantations of Bhinga, Bahraich Division, U.P. *Ind. For.*, LXIV (8), pp. 471–482, 2 pls., (1938).

The forest of Bhinga was slowly dying, as for a century or two heavy grazing and uncontrolled removal of small poles by surrounding villagers had prevented all reproduction. According to the 1935-36 working plan, a large area of about 33 sq. miles has been set apart, to be intensively worked and regenerated by *taungya*, with a view to meeting village requirements. About 400 acres per annum are already being clearfelled and successfully regenerated with valuable timber and fodder species. The technique evolved is described.

J. N. S. G.

280. SUBRAHMANYAN, V., SREENIVASAN, A. and DAS GUPTA, H. P.—Studies on quality in rice. I. Effect of milling on the chemical composition and commercial qualities of raw and parboiled rices. *Ind. Journ. Agric. Sci.*, VIII, Part IV, pp. 459–486, 2 text-figs., (1938).

As the result of parboiling, the total nitrogen content of hulled rice is increased slightly (to the extent of 2 to 3 per cent) while the phosphorus content remains practically unaffected. The high nitrogen content of parboiled (hulled) rice is due to a part of the nitrogen in the husk being fixed on to the grain during parboiling.

Only insignificant quantities of nitrogen or of phosphorus pass into the steep water used prior to parboiling. Variations in the time and temperature of steeping and of steaming or boiling during parboiling of paddy do not result in appreciable changes in the nitrogen or phosphorus contents of the husk, hulled bran and rice (kernel) of the paddy. On the other hand, these two factors do affect the colour and odour of parboiled rice. The colour is derived from the husk and the odour largely through fermentation during steeping. Both of these undesirable features can be reduced to a minimum by maintaining a continuous flow of the steep water, or, at any rate, changing it frequently.

Comparison of specimens of raw and parboiled rices milled to different degrees would show that with the same degree of milling, parboiled rice is usually richer in nitrogen and in phosphorus than raw rice. With increased milling, the difference tends steadily to diminish until, at 10 to 15 per cent, the nitrogen and phosphorus contents are more or less the same.

Study of the distribution of nitrogen and of phosphorus in the germ (embryo), bran (pericarp) and endosperm fractions of the rice (raw) grain has shown that more than 50 per cent of the phosphorus and 20 per cent of the nitrogen are localized in the former two fractions, which are generally completely lost during milling. On parboiling, a part of the nitrogen and of the phosphorus present in the germ is transferred to the endosperm.

Examination of the outer layers of the endosperm of the rice grain has shown that, even in the endosperm, the protein and mineral constituents are concentrated in the outer layers and decrease rapidly towards the interior.

Parbolied rice has a higher ash content than raw rice polished to the same extent. Both raw and parboiled rices contain, however, only traces of these mineral constituents when polished to beyond 10 per cent of their original weight.

On washing repeatedly, parboiled rice, whether polished or unpolished, loses less of nitrogen or of phosphorus than raw rice polished to the same extent. In a like manner, comparatively less of water-soluble constituents pass out in the 'rice water' on cooking parboiled rice.

The milling quality of rice varieties is greatly improved by parboiling. Between 30 and 100 per cent more of head rice is yielded with the different varieties. The different conditions relating to steeping and steaming affect the yield of head rice both before and after milling. Speaking generally, soaking for forty-eight to seventy-two hours at 35°C. followed by steaming at fifteen lbs. for fifteen minutes gives uniformly satisfactory results. Steaming for longer periods results in increased breakages. The significance of the foregoing observations in relation to the comparative nutritive values of raw and parboiled rices and the nature of the factors responsible for the colour of parboiled rice are discussed.

V. S., A. S. & H. P. D. G.

281. TAKLE, G. G.—Yield of gum from Kullu trees. *Ind. For.*, LXIV (1), p. 54, (1938).

Gives data for the yield of gum per season from *Sterculia urens* trees. These average 29 tolas per tree per annum for the Melghat Division of the Central Provinces, which is less than that reported for Damoh Division, namely 1 seer (= 80 tolas) per tree per year.

M. V. L.

282. TAMBE, G. C. and WAD, Y. D.—Biological eradication of *Kans* (*Saccharum spontaneum*) in field patches. *Agric. and Livestock in India*, VIII, p. 397, (1938).

A method is described to eradicate perennial weeds like *Kans* (*Saccharum spontaneum*) occurring in patches in cultivated fields in Central India. The method is likely to be useful under conditions where eradication by mechanical means is not feasible.

In the beginning of the monsoon, the weed growth is cut down and the patches completely covered with a compact layer, maintained about one foot thick, of green weeds or other available agricultural wastes. By the end of the season the patch becomes free of weeds. Several field patches of *Kans* at the Institute were thus successfully treated.

Wheat and cotton grown successively in these patches showed a more vigorous development than in the surrounding area. In wheat the yields of grain and straw were nearly twice and one and a half times greater respectively. The cotton matured earlier and the amount of first picking and total yields were nearly three and two and a half times greater respectively.

The physico-chemical properties of the wheat grain from the treated patches were superior.

The first six inches layer of the treated patches showed a higher content of organic matter as compared: (1) with the corresponding layer of the surrounding soil, and (2) with the nine inches layer just below it, whereas in untreated patches the first six inches layer was either equal to or poorer than the lower zone, in the organic matter content.

G. C. T. & Y. D. W.

283. THOMAS, A. R.—Effect of slash burning on soil and succeeding vegetation. *Ind. For.*, LXIV (6), pp. 362–364, (1938).

Reports observations that, in the conditions pertaining in North-East Assam, the effect of burning slash on the germination and subsequent development of *Terminalia myriocarpa* is definitely deleterious. This is contrary to the general belief that a good burn on a regeneration area is essential for the making of a good plantation.

M. V. L.

284. VAHID, S. A.—Departmental exploitation of forests in Nimar Division, C.P. *Ind. For.*, LXIV (3), pp. 168–180, 1 pl., 12 figs., (1938).

As contractor's work in the forests of Nimar Division, Central Provinces, was found to be unsatisfactory, departmental exploitation of these forests was started in 1923. With experience improved methods were introduced and the results to-day are very satisfactory. Whereas sales at Khirkiya depot in 1926-27 amounted to Rs.111 in 1936-37 these amounted to Rs.1,15,912.

S. A. V.

285. VIJAYARAGHAVAN, C. and SARMA, P. SESHADRI—R. 42—An economic recessive mutant from E.C. 593 *Ragi* (*Eleusine coracana* Gaertn.). *Current Science*, VI, No. 12, pp. 611-612, (1938).

In a plot of E.C. 593 *ragi* a strain of *Eleusine coracana* Gaertn. with 'Top-curved' ears, a single plant with 'In-curved' ears was spotted. The authors are of the opinion that the plant arose from E.C. 593 by mutation. This plant resembles E.C. 593 in all morphological characters except in the shape of ear-head. The change seems to have taken place in a single gene only as the 'In-curved' head is a simple recessive to the 'Top-curved'. It is found that R. 42 is a better yielder in comparison with E.C. 593.

P. P.

286. WARREN, W. D. M.—Crown ratio in Indian trees. *Ind. For.*, LXIV (7), pp. 435–437, (1938).

The utility of 'Crown ratio' or rather the 'diameter ratio' (i.e. the ratio between the mean diameter and the mean spacing between stems) as a practical guide in thinnings is discussed. A ratio of 18 is reported to work well for *Shorea robusta* crops of good quality.

M. V. L.

PLANT DISEASES.

287. BOSE, R. D.—The rotation of tobacco for the prevention of wilt disease in pigeon-peas (*Cajanus Cajan* (Linn.) Millsp.). *Agric. and Livestock in India*, VIII, pp. 653–668, (1938).

Experimental data are presented to show that the tobacco crop in rotation with pigeon-peas helps to control to a large extent the incidence of wilt (*Fusarium Vasinfectum* Atk.) in the latter crop. It is believed that the sterilizing effects of the nicotine content of the buried roots and stumps of tobacco stems are responsible for checking the growth and activity of the fungus and thus retarding the attaching of wilt on the host plant.

It is advocated that in addition to the use of resistant varieties of pigeon-peas, tobacco should be grown in rotation at intervals of about three or four years in fields where pigeon-peas are usually raised and where wilt takes a heavy toll from the latter crop. In low-lying lands where the cultivation of tobacco would be unprofitable, it may be enough too btain stumps of tobacco stems from elsewhere and to bury these in the soil a couple of months before sowing pigeon-peas.

R. D. B.

288. BOSE, S. R.—The nature of 'Agaru' formation. *Science and Culture*, IV, No. 2, pp. 80–91, (1938).

Healthy trees of *Aquilaria agallocha* do not bear *agaru*; the *agaru*-bearing tree has a distinct diseased appearance at the top and in the side branches, and *agaru* is collected in quantity only when such a tree is either completely or partially killed.

In order to investigate the nature of *agaru* formation, the author cut sections of diseased woods from different localities and noticed in all cases a fungus with closely septed hyphae of a dirty brown colour. The fungus was successfully grown in artificial medium and its complete life-history was studied; it belongs to the group of *Fungi imperfecti*.

Inoculation-experiments to produce the formation of *agaru* in healthy trees by this fungus-attack could not be carried out for want of *A. agallocha* trees in Bengal.

P. P.

289. **CAWS, ALFRED** and **HALDANE, J. H.**—The quality of sugarcane in Northern India in relation to borer infestation and disease infection. *Agric. and Livestock in India*, VIII, pp. 503–524, (1938).

The quality of sugarcane in Northern India is seriously affected by borer infestation and disease infection. The authors carried out an investigation in February 1938 on 107,384 stalks of cane supplied to ten factories situated in Northern India. It was found that 37,395 stalks of cane were infested, equivalent to an infestation degree of 34·8 per cent. Due to borer and disease attack, it was found that the sugar content of the cane was depressed from 13·57 per cent for sound cane to 11·23 per cent for infested cane in Eastern U.P. and from 13·45 to 10·50 per cent in Bihar. The lower sugar content of the cane adversely affects the recovery of commercial sugar and the estimated loss due to borer and disease infection of the cane supplies to ten factories during the month of February 1938 amounted to some 50,000 maunds of commercial sugar. This loss is borne by the Manufacturers while the revenue loss on Sugar Excise to Government may be estimated at Rs.75,000 based on one month of operation only by ten Sugarcane Factories. The loss to the grower is difficult to estimate but he must also suffer on account of depleted yields, field discards and rejection of infested supplies by the factories.

A. C. & J. H. H.

290. **GHATAK, P. N.**—Investigations on orange rot in storage. I. Orange rot due to two strains of *Fusarium moniliforme* Sheldon. *Journ. Ind. Bot. Soc.*, XVII, Nos. 2 and 3, pp. 141–148, (1938).

1. Oranges sold in the Calcutta market in winter are damaged by different types of rot due to fungi. Two strains of *Fusarium moniliforme* Sheldon are found to be responsible for causing a soft rot on a large number of these fruits.

2. Oranges from Darjeeling and Assam suffer more from this rot, whereas the Nagpur variety is almost free from it. Strain A_1 was isolated from Darjeeling and A_2 from Assam oranges.

3. The disease appears as a small semipliable water-soaked area on the rind of a light brown colour and later on with white patches in the centre. In the final stage the whole surface is covered with white incrustations and the fruit turns into a pulpy mass.

4. Both strains have similar morphological features with slight variations in cultural characters. The growth of the mycelium in strain A_1 is more vigorous than in A_2. The average size of the macro and micro conidia varies in length from 25–80μ and 6–10μ respectively. The proportion of micro conidia is much higher than that of macro conidia in both the strains but in strain A_1 the percentage of macro conidia is much higher than that in A_2.

5. That the fungi are strictly wound parasites were proved by inoculation experiments.

6. Cross inoculations showed strain A_1 to be more virulent. It could infect Assam or Darjeeling oranges readily and in certain cases the Nagpur variety as well. Strain A_2 could infect only Assam oranges vigorously. It was less virulent on the Darjeeling variety, and Nagpur oranges were practically immune to it.

7. It is for their difference in pathogenicity mainly that the fungi have been classified into two physiologic forms.

8. The fungi hyphae entering into the host tissue ramify in the inner side of the rind adjoining the juice vesicles. Rotting starts from within and conidia appear finally as white incrustations on the surface of the fruit.

P. N. G.

291. **LUTHRA, J. C., SATTAR, ABDUS** and **ABDUL GHANI, M.**—Perpetuation and control of Septoria disease of wheat (*Septoria tritici* Desm.) in the Punjab. *Agric. and Livestock in India*, VIII, pp. 17–25, (1938).

1. The field appearance of the disease of wheat caused by the fungus *Septoria tritici* Desm. is described.

2. Methods of perpetuation of the disease from one year to another have been discovered. These are:—

(i) The fungus on diseased wheat straw used as enclosure in making *bhusa* stacks remains viable throughout the summer. The pycnospores of the fungus from such straw cause the disease in the next wheat crop.

(ii) The fungus also remains viable in *bhusa* made from diseased straw and also in the diseased leaves which may remain lying on the surface of the soil during summer. The pycnospores of the fungus from such diseased tissue can initiate infection in the subsequent wheat crop.

3. Measures to control the disease are suggested. These deal with the suppression of the sources of infection described.

4. Relative resistance of the Punjab wheat types has been studied and it has been found that the *durum* types are almost immune and *compactum* and *vulgare* types are susceptible to the disease.

J. C. L., A. S. & M. A. G.

292. LUTHRA, J. C., SATTAR, ABDUS and BEDI, K .S.—The control of the blight disease of gram by resistant types. *Current Science*, VII, No. 2, pp. 45–47, (1938).

In the Punjab for decades of years the valuable crop gram has been suffering severely from the attack of the blight disease caused by the fungus *Ascochyta rabiel* (Pass.) Lab.

The authors have described the marked symptoms of the disease and some control measures of which the discovery of resistance types are the most important. From the field experiments it is clear that the three foreign varieties 4F32, 199 and 281 supplied by the Bureau of Plant Industry, Washington, remained outstanding regarding power of resistance.

Type 281 is most resistant, 4F32 comes next and 199 is third in this respect.

Type 4F32, being similar to a local gram and having very little of foreign features, is readily acceptable to the farmers.

The type has proved satisfactory as regards yield and thus fulfils one of the crucial tests usually applied to determine the value of a newly evolved strain from the view-point of the farmer, i.e. adequate return per acre.

For convenience of reference it has been given the new name of type F8.

This newly evolved type is evidently a great contribution to disease-resistant strains of farm crops evolved in India and is a sure means of overcoming the ravages of the serious blight disease of gram.

P. P.

293. LUTHRA, JAI CHAND, SATTAR, ABDUS and SANDHU, SARDUL SINGH—Life-history and modes of perpetuation of smut of sugarcane (*Ustilago scitaminea* Syd.). *Ind. Journ. Agric. Sci.*, VIII, Part VI, pp. 849–861, pl. lx, (1938).

Effect of different nutrient solutions, temperature and hydrogen-ion concentration of the germination of spores of *Ustilago scitaminea* Syd. has been studied.

Viability of spores under a variety of conditions has been tested.

Studies on the modes of perpetuation of the disease for four years have clearly shown that the disease is carried over from year to year by the following methods:—

By planting setts taken from smutted shoots of canes.
By spores adhering to the buds of setts at the time of planting.
By aerial infection of the buds of standing canes.
By ratooning smutted canes.

J. C. L., A. S. & S. S. S.

294. LUTHRA, JAI CHAND, SATTAR, ABDUS and SINGH, SARDUL—Occurrence of stem canker disease of sugarcane (*Cytospora sacchari* Butl.) in the Punjab. *Proc. Ind. Acad. Sci.*, VIII, No. 3, Sec. B, pp. 188–191, (1938).

The occurrence of *Cytospora sacchari* Butl. is recorded in the Punjab.

Symptoms of the disease and nature of damage caused by *Cytospora sacchari* Butl. have been described.

The parasitism of the fungus has been proved on sugarcane by inoculation experiments.

J. C. L., A. S. & S. S.

295. **Luthra, Jai Chand** and **Vasudeva, R. Sahai**—Studies on the root-rot disease of cotton in the Punjab. V. Confirmation of the identity of *Rhizoctonia bataticola*. *Ind. Journ. Agric. Sci.*, VIII, Part V, pp. 727–734, 3 figs., (1938).

Rhizoctonia bataticola which has been established as one of the causal fungi of the root-rot disease of cotton in the Punjab has so far been for convenience referred to as 22(*a*).

The identity of the fungus has now been confirmed and that *Rhizoctonia* sp. 22(*a*) is a strain of *Rhizoctonia bataticola* (Taub.) Butler. J. C. L. & R. S. V.

296. **Mitra, M.**—Effect of the locality and the time of sowing on the incidence of 'spot blotch' disease of barley. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 144, (1938).

297. **Mitra, M.** and **Mehta, P. R.**—Some leaf diseases of *Hevea brasiliensis* new to India. *Ind. Journ. Agric. Sci.*, VIII, Pt. II, pp. 185–188, pl. viii, (1938).

A disease of young leaves of the rubber plant (*Hevea brasiliensis*) was reported early in 1936, at the time of annual refoliation, from a plantation in South Travancore. The young and semi-mature leaves were attacked simultaneously but the symptoms varied with the age of the leaf. The young leaves were free from any spots, shrivelled along the edges and were readily shed from the trees. The semi-mature and mature leaves were spotted on both sides but did not drop from the trees. The brown-gray spots had a crinkled margin and looked velvety due to a closely adpressed grayish white fungus growth on their surface.

Microscopic examination of young leaves showed haustoria in the epidermal cells but sometimes hyphae in the deeper tissues were also noted. The diseased leaves developed acervuli of *Gloeosporium alborubrum* in moist chambers and in culture media. Most of the spots on older leaves had no fructification but on some 'oidium' stage of *Oidium hevae* Steinman. was manifest. Other fungi isolated from mature leaves were *G. alborubrum, Colletotrichum ficus* Kds. and its perfect stage, *Glomerella cingulata* (Stonem) S. and V.S.

Gloeosporium alborubrum and *Oidium hevae* are known to be responsible for abnormal leaf fall in other countries. The presence of both these fungi in the Indian material, therefore, seems to be the likely cause of abnormal leaf fall. These fungi are for the first time recorded in India. M. M. & P. R. M.

298. **Mundkur, B. B.**—Host range and identity of the smut causing root-galls in the genus *Brassica*. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta,* Abstract, p. 144, (1938).

299. **Prasad, H. H.**—A note on soft rot of pears caused by a species of *Aspergillus*. *Ind. Journ. Agric. Sci.*, VIII, Part IV, pp. 549–551, pl. xxv, (1938).

Severe rotting of pears occurs in Delhi market.

Damage is due to a fungus which enters as a wound parasite and under favourable conditions can rot pears completely in four or five days.

The fungus bears a close resemblance to *Aspergillus japonicus* Saito. H. H. P.

300. **Pruthi, H. S.** and **Narayanan, E. S.**—A study of the behaviour of some common varieties of sugarcane in reference to the attack of borers at Pusa (Bihar) during 1935-36. *Proc. Nat. Inst. Sci. Ind.*, IV, No. 1, pp. 87–107, (1938).

The fact that certain varieties of crops are resistant to insect attack has been established on general lines for some time past. Sugarcane which is one of the most valuable crops in India is seriously damaged by certain moth borers every year. In other countries, e.g. the West Indies, etc., where this crop is also attacked by borers, belonging to allied species, it has been found that certain varieties are more resistant to the attack of these pests than others. In India a large number of Coimbatore cane varieties are distributed every year and are tested in various provinces with regard to their yield, etc. Only occasional observations have been taken on their behaviour in reference to insect pests. Therefore, a detailed study from this view-point of the most common cane varieties of North Bihar was made at Pusa during 1935-36, the results of which are described in the paper.

The five common varieties Co. 210, Co. 213, Co. 299, Co. 313 and Co. 331 were critically studied. They were grown side by side in a randomized plot and about 800 canes of each variety selected from various parts of the field were examined every month for dead hearts (the external symptoms of borer attack), which were dissected and their causal borer determined. The number of fresh dead hearts appearing in each variety during different months of the year were noted. Examination of the data thus collected lead to the following general conclusions:—

Moths of all the three borers, viz. top-, stem- and root-borers emerge in the field in March. They lay eggs soon afterwards and the young borers hatching therefrom attack different parts of the cane and cause dead hearts which appear during April. As the season advances all the three borers become more active and cause the maximum number of dead hearts during June or July. During the monsoon months their activity decreases but soon after the rains are over it increases again. The damage by the top-borer is especially very heavy during autumn. This pest remains active almost throughout the year, whereas the dead hearts caused by the stem- and root-borers during winter are comparatively few. These results are in accordance with the observations taken by the staff of the Imperial Entomologist during the last five years or so.

As regards the comparative susceptibility of various varieties, the conclusions derived are yet only tentative as the varieties have been studied on a large scale and under properly planned experiments for one season only. Taking all the borers into consideration, Co. 313 and Co. 299 seem to be the most resistant, Co. 331 intermediate, and Co. 213 and Co. 210 the least resistant.

H. S. P. & E. S. N.

301. SADASIVAN, T. S.—Competition in fungi. *Proc. Twenty-fifth Ind. Sci. Congr., Calcutta*, Abstract, p. 144, (1938).

302. UPPAL, B. N. and KAMAT, M. N.—Powdery mildew of betel vine. *Current Science*, VI, No. 12, p. 611, (1938).

The disease is caused by an ectophytic fungus which is a new species. The name proposed for it is *Oidium piperis* sp. nov. The disease is recognized by the appearance of yellow patches on the under-surface of the leaves. Dusting of betel vines with sulphur results in complete control of mildew.

P. P.

303. UPPAL, B. N., PATEL, M. K., and KAMAT, M. N.—*Alternaria* blight of cumin. *Ind. Journ. Agric. Sci.*, VIII, Pt. I, pp. 49–62, pls. ii–iv, (1938).

Alternaria blight of cumin occurs sporadically in the Kaira district. The disease seems to be much influenced by humid conditions as the affected plants are commonly found along water-channels or in shady places in a field.

All aerial parts of the plant are attacked. In the early stage of the disease the affected plants show minute, whitish necrotic areas which turn purple with age and later become brown and finally black. These areas are first exceedingly small in extent but, as they enlarge, become obliterated in the general invasion. The disease ultimately kills the affected parts, particularly the succulent leaves and blossoms. It is named blight.

Wet weather favours the development of the disease which may assume serious proportions if it appears at flowering. The attacked plants bear no seed, but if some seed is produced it is usually shrivelled, dark coloured and of poor germinability.

The morphology and cultural characters of the causative organism have been described. The mycelium of the fungus produces the enzymes emulsin, trypsin, erepsin, amylase, lipase and inulase.

The fungus is extremely pathogenic on cumin, but the presence of moisture is essential for successful infection. Cross inoculation experiments with the cumin fungus gave negative results.

The fungus is able to oversummer in plant residues in the field. It is probable that infected seed also plays an important part in the perennation of the fungus and in initiating primary infection.

The fungus is a new species of *Alternaria*, and the name *Alternaria burnsii* is proposed for it. A description of the fungus is given together with a Latin diagnosis.

B. N. U., M. K. P. & M. N. K.

VIII. ZOOLOGY

(including Pure and Applied Zoology, Veterinary Zoology, and Anthropology including Ethnology).

GENERAL ZOOLOGY.

1. ABDULALI, H.—The food of the Mugger (*Crocodilus palustris*). *Journ. Bombay Nat. Hist. Soc.*, XL, p. 336, (1938).

The author records that the Mugger feeds on the fallen fruit of the 'Oomber' (*Ficus glomerata*).

M. L. R.

2. AGARWALA, A. C.—Zoology in relation to Veterinary Science. *Agric. & Live-stock in Ind.*, VIII, pp. 669–674, (1938).

The author, after defining Veterinary Science in terms of animal husbandry, has stressed upon the maintenance of animal health and efficiency, including protection from the ravages of disease as an all-important factor for the success of Indian agriculture. Without a true knowledge of the cause of disease, remedial measures cannot be appropriately determined and effectively applied. The elucidation of the cause of disease, however, is not altogether a one-man issue. There are so many sides of a disease that the definition of causation invariably requires the collective effort and opinion of experts in special sciences before any tangible summing up can be arrived at. A suitable team of research workers, including physicists, chemists, biochemists, botanists, zoologists, veterinarians, etc., must all collaborate. A zoologist is particularly indispensable in the field of Veterinary Parasitology which includes Veterinary Protozoology, Helminthology and Entomology. Even to-day comparatively little is known about a number of parasites which set up a variety of diseased conditions in domestic animals and are responsible for heavy losses to the country. Apart from this, a working knowledge of zoology is essential not only to qualify as a veterinarian but also for the everyday duties of a qualified veterinary surgeon. Again, in animal breeding, a knowledge of the principles of evolutionary biology and an up-to-date study of the research work carried out in the field is extremely useful. The author, as a veterinary field worker, points out that while tackling Veterinary Parasitology one should not become so much engrossed with the parasite as to forget the disease.

AUTHOR.

3. AIYAR, R. GOPALA—*Salmacis* (the Indian Sea-urchin). *Ind. Zool. Mem.*, VII, pp. 1–69, 47 text-figs., (1938).

This is the seventh of the 'Indian Zoological Memoirs on Indian Animal Types' founded and edited by Prof. K. N. Bahl. The book contains thirteen chapters. Of these, the first is introductory and deals with the systematics of *Salmacis*, the second with external characters and the third with the skeleton. Chapters four to ten deal with the internal anatomy in detail. The eleventh chapter deals with development, the twelfth with bionomics and the thirteenth with directions for practical work. The book is primarily meant for the student and the teacher in Indian Universities, but has a wider scope.

M. L. R.

4. ALIKHAN, I.—Method adopted by Leopards in hunting monkeys. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 555–557, (1938).

The author describes the hunting of monkeys by leopards in the United Provinces. The leopard climbed the tree to catch the monkey. The hunt took place in mid-day in hot May.

M. L. R.

5. A. M. D.—Annual Report on Game Preservation in Burma, 1936-37. *Indian Forester*, LXIV, pp. 629–630, (1938).

This is a *review* of the *Ann. Rept. Gam. Pres. Burma for 1936-37*. The report reveals that much progress has been made in game preservation in Burma. There are about 35,499 licensed firearms in Burma, of which only 15,282 are licensed for sport. The establishment of the Pidaung Sanctuary is pointed out as a great step forward.

M. L. R.

6. AMIN, M.—The incidence of cestode parasites among ovine hosts in the Punjab. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 158, (1938).

7. ANON.—The occurrence of *Corynebacterium equi* in a she-buffalo. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 225–234, (1938).

Corynebacterium equi, which has hitherto been shown as a pneumonia-causing agent in young equines, is now demonstrated by the author to be the probable aetiological factor in either abortion or post-abortion pyometra in a she-buffalo.

M. L. R.

8. ANON.—Heather Beetle. *Indian Forester*, LXIV, pp. 245–248, (1938).

This is an extract from an article that appeared in the *Statesman*. It concerns *Lochmaea suturalis*, a Chrysomelid beetle destructive to the roots of heather in England and Wales.

S. R.

9. ANON.—Elephants. (From *Ayeen Akbari.*) *Indian Forester*, LXIV, pp. 286–292, (1938).

This is an extract of pp. 95–102 of Francis Galdwin's translation (in 1783) of *Ayeen Akbari* by Abul Fazal. Four kinds of elephants are recognised, *viz.*, *Behdar*, *Mund*, *Murg* and *Mirh*, and fantastic description given of each kind. The account contains many fallacies about the elephant's life. The price of an elephant is given as rupees one hundred to rupees one lac. Tables of the daily food allowances sanctioned by Akbar for the elephants are given.

M. L. R.

10. AYYAR, T. V. RAMAKRISHNA—Two caterpillars of economic importance not recorded before in S. India. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 182, (1938).

11. AYYAR, T. V. RAMAKRISHNA—The economic rôle of South Indian horn worms (Sphingidae). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 182, (1938).

12. AYYAR, T. V. RAMAKRISHNA—A caterpillar pest of Champaka (*Michelia*) in South Malabar district. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 188, (1938).

13. AYYAR, T. V. RAMAKRISHNA—An annotated conspectus of the insects affecting fruit crops in South India. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 186, (1938).

14. **Ayyar, T. V. Ramakrishna**—Two caterpillars of economic importance not recorded before from S. India. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 336–338, (1938).

The author records *Pyenarmon cribrata* F. and *Phostria piasusalis* W. as pests of the Koorkan plant (*Coleus parviflora*), in Malabar. Brief notes on the bionomics of these insects are also given. The braconid wasp, *Microgaster psarae* W., is recorded as parasitising caterpillars of *Pyenarmon cribrata* F.

S. R.

15. **Baldwin, M. J. F.**—A fortnight in the 'blue'. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 59–63, (1938).

The author gives his experiences of tiger-shooting in the Bengal Duars.

M. L. R.

16. **Basu, B.**—A comment on the name 'blood-sucker' applied to *Calotes versicolor* (Daud). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 577, 578, (1938).

The author points out that the name 'blood-sucker' commonly given to the *Calotes* lizard is unjustified as the lizard is not a blood-sucker.

M. L. R.

17. **Bates, R. S. P.**—On the parasitic habits of the Pied Crested Cuckoo *Clamator jacobinus* (Bodd.). *Journ. Bombay Nat. Hist Soc.*, XL, p. 125, (1938).

The author mentions an instance of the Jungle Babbler rearing two eggs of *Clemator jacobinus*, besides, presumably, nine of the babbler.

M. L. R.

18. **Baweja, K. D.**—Ecological study of soil organisms in the sterilised soils of Rothamstead. *Proc. Twenty-fifth Ind Sci. Cong.*, Calcutta, Abstract, p. 180, (1938).

19. **Beeson, C. F. C.**—Undergrowth and the biological control of teak defoliators. *Indian Forester*, LXIV, pp. 485–492, (1938).

The value of undergrowth in the biological control of defoliators in teak plantations has been investigated and species of plants are listed which are (*a*) desirable because they are the food-plants of defoliators that are alternative hosts of parasites of *Hapalia machaeralis* and *Hyblaea puera*, or (*b*) undesirable because they are alternative food-plants of *H. machaeralis* or *H. puera* or of other pests of teak. A statement of the distribution of identified parasites of teak defoliators is given, and experiments in the introduction and colonisation of parasites between Burma, North India and Madras are described.

S. R.

20. **Beeson, C. F. C.**—Carpenter bees. *Indian Forester*, LXIV, pp. 735–737, (1938).

Notes are given on the habits of seven species of carpenter bees which are pests in forest rest-houses, boring roofing-rafters and posts and bamboos. Remedial measures are suggested.

C. F. C. B.

21. **Best, J. W.**—The International Game Exhibition in Berlin. *Indian Forester*, LXIV, pp. 234–238, (1938).

The author gives a brief account of the International Game Exhibition in Berlin (1938), with special reference to the British Section. Mention is made of some of the prize-winning heads and animal photographs.

M. L. R.

22. **Betham, R. M.**—The Indian Long-tailed Nightjar (*Caprimulgus macrourus albononotus* Tickell). *Journ. Bombay Nat. Hist. Soc.*, XL, p. 124, (1938).

The author mentions that in Dehra Dun on April 15, 1919, he observed this nightjar sitting on two eggs. The bird showed remarkable concealment coloration.

M. L. R.

23. **Bhalerao, G. D.**—Schistosomes and schistosomiasis in India. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 149–158, (1938).

The author describes in detail the history of the study of schistosomes and schistosomiasis in India. This select article is reprinted from the 'Papers on Helminthology' published in commemoration of 30-year Jubileum of the Scientific, Educational and Social Activities of the Honoured Worker of Science, K. J. Skrjabin, M.Ac. Sci., and of the Fifteenth Anniversary of the All-Union Institute of Helminthology.

M. N. D.

24. **Brahmachari, K.**—On the bionomics of a Bagworm (*Kophene cuprea* M.) on banana. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 56–61, 6 text-figs., 1 pl., (1938).

In this paper the author describes and figures the life-history of the Psychidid moth *Kophene cuprea* M., found damaging banana at Saidapet (Madras) in March, 1937. He also gives accounts of the habits, sexual union of the adults, mode of oviposition and method of bag making by the larvae, and also includes a note on the nature and extent of the damage done to banana.

Only the larva is parasitised by a small Tachinid fly, but the percentage of infection is almost negligible, being from two to five per cent.

According to the author, Ichneumonids usually show a preference for Psychidid moths and he has bred *Goryphus nursei* Cam. from *Clania crameri*. He has also recorded an unidentified Bombylid fly as a parasite of another Psychidid.

S. R.

25. **Burton, R. G.**—Wild beasts—real and apocryphal. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 112–113, (1938).

The author refers to a recent controversy in *The Times* (London) regarding the source of some mysterious foot-marks encountered in 1935 by a traveller named Kulback at 16,000 feet in the Himalayas. The source of these marks was attributed by some to the Himalayan Black Bear, by others to the Tibetan Blue Bear, while still others attributed it to the 'Mountain Men'. The author points out that the last-named are mythical forms, and that such mythical monsters are believed to exist in other countries also.

M. L. R.

26. **Buxton, P. A.**—Quantitative studies on the biology of *Xenopsylla cheopis* (Siphonaptera). *Ind. Journ. Med. Res.*, XXVI, pp. 505–530, (1938).

The author has developed an apparatus in which it is possible to maintain a rodent and a population of fleas under conditions which can be controlled and measured, but which are at the same time nearly natural. The experimental chamber is put in a thermostat and through it a stream of air of controlled humidity is passed. As the mouse inevitably adds water to the atmosphere it is important that the rate of flow of air should be regular. A special valve which can be set to pass a certain volume of air per hour has been devised. The only important variable which is not controlled is the consumption of adult fleas by the mouse. With this apparatus it is possible to maintain stable conditions for several weeks on end, counting the original fleas from time to time by removing the bedding and incubating it under controlled conditions of temperature and humidity. One may obtain and count adult fleas of the second generation.

The survival of the P (parental) fleas, up to 7 days, is not affected by temperature or humidity. This is consistent with what is known of the physiology of the adult flea.

It is probably true to say that its loss of water, even at high temperature and low humidity, is insignificant, and that the loss can be made good at the insect's next meal.

The proportion of adult (P) fleas on the mouse and in the bedding at the end of an experiment varied greatly. The differences did not appear to be related to climatic conditions. There was a tendency for a higher proportion of ♀♀ fleas to be on the mouse. The 'flea count', a technique used so widely, should be submitted to experimental study.

Fleas of the F (first filial) generation were bred out, the material being kept under the climatic conditions to which the parental fleas had been exposed. No emergence of F fleas occurs when the humidity is below a certain saturation deficiency, which is not the same at all temperatures. Even at one temperature and within tolerable limits of humidity, the production of F fleas is closely dependent on humidity, the production being less as the fatal limit is approached. The period occupied by the early stages is also influenced by humidity, probably because the growth of the larva is retarded when the water content of the food is low. These observations on the production of F fleas are consistent with what is known of the physiology of the larval stage. The larva is not capable of much resistance to desiccation, losing water with its excrement, and probably also in respiration (in spite of possessing a spiracular-closing device).

The production of offspring is best expressed as the number of (adult) F fleas produced per day of life of the P fleas. Figures such as these are obtained:—

Temperature °C.	Saturation Deficiency (mean, mm. Hg.)	Offspring per ♀ per day.
24	2·3	1·5
..	6·7	0·6
28	5·7	2·0
..	11·3	1·1
32	8·9	6·1
..	11·4	2·2

P. A. B.

27. BUXTON, P. A.—The effect of climatic factors on the flea *Xenopsylla cheopis*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 181, (1938).

28. CHAMPION, H. G.—An albino Sambar. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 322, 323, (1938).

The author describes the find of an albino Sambar in the forests of the United Provinces.

M. L. R.

29. CHAMPION-JONES, R. N.—Drumming of woodpeckers. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 123, 124, (1938).

The author points out that while drumming on the bark of trees is common among woodpeckers, the reason thereof is not known. With his several years' experience in the Indian jungles, he could not elucidate the reason. The Editors, in a postscript, refer to a paper by Buxton in the *Field* (1937) where that author points out that the drumming is not for attraction of the opposite sex. Parker (*Field*, 1937), however, maintains that the drumming is not by repurcussion but is purely vocal and emanates from the bird's throat.

M. L. R.

30. CHAMPION-JONES, R. N.—The head shields of the Hamadryad, *Naia hannah* (Cantor): an abnormal example. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 336, (1938).

The author records an abnormal Hamadryad with a small scale interposed between the parietals and the two occipital shields. Another abnormal feature is the divided left-hand occipital.

M. L. R.

31. Chatterjee, G. C. and Mitra, A. N.—Evolution of the neuromotor apparatus and the skeletal structures of Trichomonads. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 155, (1938).

32. Chatterjee, N. C.—Entomological investigations on the spike disease of Sandal. [Heteroptera (Hemipt.).] *Ind. For. Rec.* (E), III, pp. 213–225, (1938).

This paper records four species of Pyrrhocoridae, one of Aradidae, three of Tingitidae, one of Hydrometridae, seven of Phymotidae, seven of Capsidae, one of Pelogonidae and one species of Notonectidae frequenting the foliage of Sandal, *Santalum album* Linn., collected by the Forest Research Institute survey of the insect fauna of that tree in North Salem, Vellore, Madras and North Coorg forest divisions, South India. N. C. C.

33. Chaudhri, G. M.—Tiger census. *Indian Forester*, LXIV, pp. 612–615, (1938).

A tiger census—the first of its kind—was carried out in the Palamau division in 1934. A report of the census appeared in the *Indian Forester*, 1934. In 1936 a second census was carried out over the whole division and the results are given in the present article, as also the results of the third census held in 1938. J. N. S. G.

34. Cherian, M. C.—Mite (Acarina) pests of crops in S. India and methods for their control. *Agric. & Live-Stock in Ind.*, VIII, pp. 537–540, (1938).

The species recorded in this paper include *Tetranychus telearius* on ganja, castor, tomato, Cambodia cotton, rose and jasmine; *Tetranychus fici* Hirst on figs; *Tetranychus bioculatus* Wood-Mason on tea; *Tetranychus hindustanicus* Hirst on Persian neem and margosa; *Tetranychus* sp. (nov.), on 'ladies' finger (*Hibiscus esculentus*); *Paratetranychus indicus* Hirst on *Sorghum* and sugarcane; *Paratetranychus punicae* Hirst on pomegranate and grape-vine; *Eriophyes carinatus* Green on tea and *E. gossypiella* on cotton (*Gossypium herbaceum* and *G. indicum*). The more important natural enemies of mites noted are *Scymnus gracilis* (Coccinellidae), *Scolothrips sexmaculatus* (Thripidae) and *Oligota flaviceps* (Staphylinidae). The remedial measures suggested include the use of sulphur preparations.

M. C. C.

35. Cherian, M. C. and Basheer, M.—*Brachymeria excarinata* Gahan (Family Chalcididae), a pupal parasite of *Plutella maculipennis* Curtis in South India. *Proc. Ind. Acad. Sci.* (B), VII, pp. 289–299, 1 pl., (1938).

Brachymeria excarinata Gahan is a pupal parasite of *Plutella maculipennis*. This, together with *Tetrastichus* is able to reduce the numbers of the pest considerably. The wasps are fairly long lived, the maximum longevity in one case being 140 days. Normally, the parasite lays only one egg in the pupa provided sufficient number of pupae are present. The maximum number of eggs laid by a female was 213. No hyperparasites have been collected so far. Cases of parthenogenesis were, however, met with. The parasite takes 10–15 days to complete its life-cycle. M. C. C. & M. B.

36. Comyn, K.—Swifts in swallows' nests. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 575, 576, (1938).

The author describes, from his observations in the Siwalik Hills, eight miles from Dehra Dun, what he interprets as instances of the Common Indian House Swift (*Micropus affinis*) purloining and occupying the nests of the Red-rumped Swallow (*Hirundo daurica*).

M. L. R.

37. **Connor, Sir F.**—Notes on the earwig *Dicrana kallipyga* Dohrn. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 338, 339, (1938).

In these notes the author has embodied his observations on the method of feeding and reproduction by *Dicrana kallipyga* Dohrn. According to him the earwig uses its forceps for holding the food and conveying it to the mouth. Characters for the separation of the two sexes are also given.

S. R.

38. **Crew, F. A. E.**—Heredity and disease resistance. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 1, 2, (1938).

In this brief review the author emphasises that the resistance of an individual to infection is determined largely by genetic factors.

M. L. R.

39. **Dass, B. C.**—White Sambar. *Indian Forester*, LXIV, p. 446, (1938).

The author records the finding of an albino Sambar fawn in the Jaisamand Forest (Aravali Hills) in Udaipur State (Rajputana).

M. L R.

40. **Daver, S. R.**—Cause of sore neck in Sambar. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 118–122, (1938).

A circular bare and hairless patch on the throat of Sambar (*Rusa unicolor*) has, during the last twenty years, excited much controversy as to its origin. It has been variously regarded as due to a form of leprosy, change of horns, change of hair, etc. The author, however, attributes it to 'atavistic degeneracy', and the patch represents the place where the gills used to be in its ancestors. (What the author means by this explanation is by no means clear !)

M. L. R.

41. **Editor**—Further notes on and the loss of the 'Maurice' the tame Indian Grackle. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 113–115, (1938).

42. **Editor**—Pangolin and Sambar: a curious belief. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 322, (1938).

Attention in this note is called to the curious belief among aborigines, reported by the Chief Forest Officer in Bastar State (Central Provinces), that when a Sambar comes across a Pangolin, the former rears itself up on its hind legs, while the latter rolls itself up. The Sambar then comes down again and again upon the Pangolin until a couple of the latter's bony scales are dislodged, the Sambar immediately swallowing up the scales of the Pangolin.

M. L. R.

43. **Editor**—One hour's struggle with snake? 72-year old man's ordeal. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, p. 93, (1938).

A newspaper report appeared some time ago that in Bulgaria a 72-year old man was attacked by a puff-adder, and the old man and his daughter had to fight with the snake for an hour before they could kill it. The Editor points out that the snake in question was probably a python, not a puff-adder, since the latter does not occur in Bulgaria.

M. L. R.

44. **Fateh-ud-Din, M.** and **Singh, B. D.**—Measures against sugarcane pests in Jullundur Circle. *Proc. Twenty-fifth Ind. Sci Cong.*, Calcutta, Abstract, p. 186, (1938).

45. **Fraser, F. C.**—A cicad shikar. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 35–41, (1938).

The author records the field observations he made on cicads and gives an account of the habitat in which they live.

S. R.

46. **Greenwood, J. A. C.**—A strange accident to a vulture. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 330, (1938).

The author records an instance in which the attacking vulture was presumably caught by the attacked calf, which, was dying in its mouth, since both were found dead together.

M. L. R.

47. **Hakim-ud-Din, M.**—Ticks. *Indian Forester*, LXIV, p. 698, (1938).

Continuing the correspondence on ticks, the writer in commenting upon the efficacy of G. S. Shirley's remedy for tick bites, already recorded elsewhere in the same volume, has added still another remedy for those ticks which find their way into the clothing of forest workers. The cure recommended is the use of the following solution, tried successfully by him:—4 ozs. kerosene oil, 4 ozs. mustard oil, 2 naphthaline balls, 2 teaspoonfuls of ordinary salt and 2 teaspoonfuls of mag. sulph. A little of this solution should be rubbed on the body for a few minutes, then a hot bath taken after applying carbolic soap. This not only kills the ticks but also cures the tick bites. The clothes worn by forest workers should be put into boiling water for a while so as to kill the ticks in the clothes.

S. R.

48. **Harman, A. C.**—Extension of the range of the moth *Norraca longipennis* Moore (Notodontidae). *Journ. Bombay Nat. Hist. Soc.*, XL, p. 578, (1938).

This is the first recorded find in India of the moth *Norraca longipennis* Moore which had hitherto been known only from Ceylon and Penang.

S. R.

49. **Haswell, F. W.**—Curious behaviour of elephants. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 560, (1938).

The author describes an instance in which elephants failed to recognise men within a few feet of them and in full view.

M. L. R.

50. **Hill, W. C. O.**—A curious habit common to Lorisoids and Platyrrhine monkeys. *Spol. Zeyl.*, XXI, p. 65, (1938).

It is well known that Platyrrhine monkeys of the family Cebidae (*Cebus; Saimiri*) micturate on its own hands and feet when alarmed. The author reports a similar behavioral complex in the Lorisoidea (*Loris; Nycticebus; Galago*). The habit does not occur in the genus *Lemur* or in any Catarrhine monkey.

M. L. R.

51. **Hill, W. C. O.**—The mode of carrying the tail in Leaf-monkeys. *Spol. Zeyl.*, XXI, pp. 66, 67, (1938).

The author observes that the mode of carrying the tail in different Leaf-monkeys is more or less constant for the species. The author notes three tyes: (i) Tail hanging down straight behind the body (*Kasi, Trachypithecus* and *Presbytis*). (ii) Tail held in a single loop (*Semnopithecus entellus*). (iii) Tail carried aloft in the form of the letter S (*Semnopithecus priam*).

M. L. R.

52. **Hobday, Sir F.**—The inter-relativity of the diseases of animals and man. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 91–98, (1938).

The author emphasises the inter-relatedness of the diseases of animals and man. He illustrates his thesis by reference to diseases like glanders, rabies, anthrax, foot- and mouth-diseases, tuberculosis and mange.

M. L. R.

53. **Hora, S. L.**—A preliminary note on the spawning grounds and bionomics of the so-called Indian Shad, *Hilsa ilisha* (Hamilton), in the river Ganges. *Rec. Ind. Mus.*, XL, pp. 147–157, (1938).

An historical review of the *Hilsa* investigations in Bengal is given and attention is directed to the work of the Madras Fisheries Department on the same subject. It has now been definitely established that *Hilsa* reside in the rivers, mostly in the estuaries, and rarely go out to the sea. Thus the fish, as pointed out by Prashad, is not to be regarded as a true anadromous species.

The probable course of the life-history of *Hilsa* from the egg or minute larval stage to the adult stage in the Calcutta Corporation Waterworks at Pulta is traced, and evidence is adduced to show that the supply of larval *Hilsa* is obtained from the river Hooghly year after year. The occurrence of young *Hilsa* in the filter-beds during a great part of the year shows that the fish probably breeds in the river over an extensive period, though its peak-period of breeding occurs during the rainy season. From the occurrence of ripe males and females in the Waterworks during the rainy season, it is presumed that the fish can probably breed in confined water also. The probable rate of growth of the species in the Waterworks is indicated.

Failure to find eggs and very young stages of *Hilsa* in the river Hooghly with the help of plankton nets and by collecting along the banks is recorded. A regular fishery of young *Hilsa* in November is reported from an examination of catches made in the river at Nawabgunge near Calcutta. From the size of young specimens collected at Nawabgunge during November to February it is inferred that the young fish do not reside in the river but pass down to the estuaries. The probable life-history of *Hilsa* in the river is indicated and considerable support is lent to the biological observations already made by the Madras Fisheries Department. Observations on the food of young *Hilsa* and on the establishment of hatcheries for the artificial propagation of the species are made. From the destruction of young *Hilsa* on a vast scale in the river Hooghly, it is suggested that attention should be paid to the conservation of the *Hilsa* fisheries rather than to the establishment of hatcheries for the artificial breeding of this fish.

AUTHOR'S SUMMARY.

54. **Hora, S. L.**—Changes in the drainage of India, as evidenced by the distribution of freshwater fishes. *Proc. Nat. Inst. Sci. India*, IV, pp. 395–409, (1938).

Attention is directed to the fact that freshwater fishes constitute an important group for the elucidation of palaeo-hydrographical problems. The geological structure of India is briefly described and from the occurrence of the Dipnoan and Ganoid fishes in the Kota-Maleri beds of the Upper Gondwana period the position of one of the main drainage channels of the Mesozoic period is indicated. From the location of the infra- and inter-trappean beds containing fish-remains it is pointed out that the main drainage of the Peninsula did not undergo any change after the Upper Gondwanas and during the formation of the Deccan traps. From the occurrence of estuarine fishes in the various infra- and inter-trappean beds of the Central Provinces it is concluded that the drainage of the Peninsula was towards the north-west. Evidence is adduced from various sources to show that there was a reversal of the drainage in the post-trappean period. From the nature of the valleys of the Peninsular rivers and from certain other features of the physiography of the Peninsula it is concluded that the present-day lower portions of the rivers are of great antiquity whereas the upper reaches are of a comparatively recent age.

In considering the changes in the drainage of extra-Peninsular India and the Indo-Gangetic Plain, attention is directed to the fact that before the time of the formation of these regions modern bony fishes had already become the dominant group and among the Siwalik rocks remains of some of our present-day species are entombed. Some salient features of the distribution of Indian freshwater fishes are enumerated, and a number of hypotheses to account for the known facts of distribution are advanced. It is indicated that the young Himalayas had a consequent drainage and that their deep gorges are a secondary feature. Evidence is adduced in support of the great Tertiary river of Pilgrim and Pascoe and it is shown how through two localised upheavals of the Himalayan foothills at different periods this mighty river became dismembered into three hydrographic divisions, the Brahmaputra, the Ganges and the Indus. Attention is directed to the differences between the fish-faunas of India and Burma, and it is supposed that some form of isolation must have been responsible for the divergence in these faunas.

In conclusion attention is directed to the origin of the Indian freshwater fish-fauna from South Chinese sources, and an explanation for the similarity between the fish-fauna of the Peninsula and the Malay region is given.

Some of the authenticated historic changes in the course of certain rivers of the Indo-Gangetic Plain are briefly referred to, and it is pointed out that they are too recent to have left any impression on the distribution of fishes, especially of the Indo-Gangetic region which has a uniform fauna over a very wide area. AUTHOR'S SUMMARY.

55. HORA, S. L.—On the age of the Deccan Trap as evidenced by fossil fish-remains. *Current Science*, VI, pp. 370, 372, (1938).

The systematic position of the fossil fish-remains from the inter-trappean beds at Dongargaon and from the inter-trappean beds at Takli, Paharsingha, Deothan and Kheri along with their known geological ages are tabulated. The distribution in space and time of the 10 principal types of trappean fishes is discussed, and it is concluded that these beds were probably laid down in the early tertiaries when the lower part of the supposed land connection between India and Africa had already disappeared and when the area occupied by the beds was not very far from the sea coast. It is further pointed out that there was probably sufficient interval between the formation of the infra- and the inter-trappean beds to permit the change from a predominantly Ganoid fauna, comprising *Lepidosteus* and *Pycnodus* of the Lameta beds at Dongargaon, to a fauna of almost exclusively Teleostean fishes, such as the Clupeidae, the Osteoglosidae, the Cyprinidae and a great variety of Acanthopterygians, in the inter-trappeans at Deothan and Kheri.

From an ecological point of view, one thing seems fairly certain that the conditions usually associated with a large and deep river characterised the infra-trappean period, and that by the advent of the inter-trappean period marshy conditions, usually associated with the mouths of large rivers, had set in. AUTHOR'S SUMMARY.

56. HOWSON, C.—Otters and crocodiles. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 557, 558, (1938).

The author describes the case of an otter killing a crocodile in Bundi, Rajputana. He further points out that the recent decrease in the number of crocodiles in the sacred lake of Pushkar, near Ajmer, is due to the incursion of otters. M. L. R.

57. HUBBACK, T.—Principles of wild-life conservation. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 99–111, (1938).

The author discusses the principles of wild-life conservation, with special reference to Malaya. He points out how scanty is the recognition of the value of such conservation in these regions, including India. The author forcefully advocates wild-life conservation.

M. L. R.

58. HUBBACK, T.—Malayan Gaur or Seladang (*Bibos gaurus hubbacki*). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 8–19, 5 plates, (1938).

The Malayan Gaur is now recognised as a distinct subspecies, different from the Burmese form. Unlike other Ungulates, the Gaur sweats. The calf of the Malayan Gaur is bright golden bay. There is no special breeding season and calving takes place at all times of the year. The gestation period is nine months. The Gaur makes four kinds of sounds to suit different occasions. Their main food in Malaya consists of grasses, especially the grass locally called *rumput chengkenit*. Contrary to the usual belief, the beast is quiet and docile, not ferocious. M. L. R.

59. **Hussain, A. G.**—A preliminary note on the bionomics and mass-breeding of *Trichogramma* sp. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 188, 189, (1938).

60. **Ibbotson, J.**—A baby elephant. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 558, 559, (1938).

The author gives the behaviour of a baby elephant born in captivity in the United Provinces, and later sent to the London Zoo.

M. L. R.

61. **Jacobs, S. E.** and **Raichoudhury, D. P.**—The bacterial flora in the gut of the larvae of the Cocoa Moth, *Ephestia elutella* Hb. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 191, (1938).

62. **Jenkins, J. T.**—The fisheries of Bengal—can they be improved and developed? *Current Science*, VI, pp. 373–375, (1938).

The author deals with the effect of the Japanese steam trawlers in the Indian Ocean on the fish supply of Calcutta and is of the opinion that 'no Japanese or other steam trawling company working in the Bay of Bengal with headquarters at Calcutta could hope to compete successfully with a company prepared to develop and utilise the local fisheries carried on by Indian fishermen; provided the two main difficulties are overcome and these are, as indicated, rapid transport and proper preservation of the fish until it reaches the consumer'.

According to the author there are two main methods by means of which the fish supply of Calcutta can be improved: (i) The expansion and organisation of the local methods of fishing, and (ii) the introduction of foreign methods of fishing. The author, however, prefers the first of the two methods, and gives important practical suggestions for the improvement of the fisheries of Bengal.

S. L. H.

63. **Kaura, R. L.** and **Iyer, S. G.**—Studies on a natural outbreak of pigeon-pox. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 199–212, (1938).

In a natural outbreak of pigeon-pox which occurred in a stock of healthy pigeons at the Imperial Veterinary Research Institute, Muktesar, the authors found that the causative agent was a filterable virus. They claim this to be the first recorded outbreak in India. The virus showed a certain degree of antigenic variation from the English strain, but resembled that strain regarding pathogenicity and capability to protect fowls against fowl-pox. Complement fixing bodies were rarely demonstrable in the sera of healthy as well as pigeon-pox immune birds.

M. L. R.

64. **Khan, H.**—The food of Brown Trout (*Salmo fario* L.). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 428–438, (1938).

The author has investigated the stomach contents of 102 examples of the Brown Trout from the Beas River in the Kulu Valley (Punjab). The food consists of several aquatic and terrestrial insects and their larvae, young fish, spiders, centipedes, snails and slugs, crustacea. earthworms and, finally, frogs and tadpoles. Some other general conclusions regarding the cause of preferment of certain foods at particular seasons are also given.

M. L. R.

65. **Lal, K. B.**—The relative efficiency of some methods for comparing Jassid population in cotton fields. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 191-192, (1938).

66. **Lanney, P. A.**—The mating of elephants. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 323, 324, (1938).

The author, from an observation in East Bengal, confirms that copulation in the elephant takes place in a manner normal to quadrupeds. M. L. R.

67. **Logan Home, W. M.**—Some notes on butterflies and big game in Kashmir. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 49–55, 2 pls., (1938).

The author gives an account of his combined butterfly collecting and big game shooting expedition in Kashmir in 1934. Primarily concerned with butterflies, he has listed in detail the several species taken at different stages of his journey through Kashmir, the Sind Valley and Baltistan. With regard to big game he has remarked upon the scarcity of Markhor in the Moji Nullah and the absence of young kids of the year with the few does that he saw, and invites information on the position of Markhor in the Kajnag since 1934. He has also recorded from the Chogolungma Glacier the bag of a 42-inch inbex and a brown bear from the right bank at the far side, and a 46-inch ibex, from the left bank several miles up the glacier. S. R.

68. **Lister, F. H.**—Occurrence of tiger in Northern Sikkim. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 553, (1938).

The author records the find of a tiger in Lachung (8,800 ft.) in the extreme north of Sikkim. M. L. R.

69. **Livesey, T. R.**—Egg-laying of the Khasia Hills Cuckoo (*C.c. bakeri*) in the nest of the Burmese Stone Chat (*Saxicola caprata burmanica*). *Journ. Bombay Hist. Soc.*, XL, pp. 125–127, (1938).

The author mentions an instance of the egg-laying of the Khasia Hills Cuckoo (*Cuculus canorus bakeri* Hartert) in the nest of the Burmese Stone Chat at Taunggyi in Southern Shan States, Burma. M. L. R.

70. **Livesey, T. R.**—Cuckoo problems. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 127, (1938).

The author points out that in his article 'Cuckoo Problems' (Vol. XXXVIII, No. 4, 1936), by the term 'desire' he meant an 'inherited urge to parasitism'. M. L. R.

71. **Livesey, T. R.**—Cuckoo problems. *Journ. Bombay Nat. Hist. Soc.* XL, pp. 329, 330, (1938).

The author suggests that experiments and observations should be carried out to find out the reactions of the birds which foster cuckoo's egg when such birds first find the cuckoo's egg in their nests. M. L. R.

72. **Livesey, T. R.**—Egg stealing by Khasia Hills Cuckoo (*Cuculus canorus bakeri* Hartert). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 561–564, (1938).

The author describes in detail how the female cuckoo stole three eggs out of four from the nest of the Burmese Stone Chat, *Saxicola caprata burmanica*. M. L. R.

73. LIVESEY, T. R.—Call notes of the Burmese Plaintive Cuckoo (*Cacomantis merulinus querulus*). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 564–567, (1938).

The author describes the three kinds of call notes of the Burmese Plaintive Cuckoo. The first is the plaintive call: '*Tee-tee-tee-tee-tita-tita-tita-tee*', uttered by the male. The second is the cheerful call: '*Tweet-ta-twee . . . tweet-ta-tweet*', uttered by the male and probably also by the female. The third is a screech: '*Tchree-tchree—*'.
M. L. R.

74. MAPLESTONE, P. A. and BHADURI, N. V.—*Taenia solium* and *Cysticercus cellulosae* in India. *Ind. Journ. Med. Res.*, XXV, pp. 155–161, (1937).

The authors give a summary of available information regarding *Cysticercus cellulosae* and *Taenia solium* in India. It is an interesting note on the possible causes of spreading of the infection in which they suggest a thorough study of the epidemiology of the parasite in India before the disease can be adequately controlled.
M. N. D.

75. MORRIS, F. K.—Explorations in the Gobi Desert. *Science and Culture*, III, pp. 502–505, (1938).

The author records his observations made during explorations in the Gobi desert. The age of mammals is richly represented. Many of the mammals showed affinity with America; but many others were Asiatic, or even exclusively Gobian.
M. N. D.

76. MORRIS, R. C.—Measurements of tiger. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 114, 115, (1938).

The author gives the measurements and weight of some tigers, panthers and bisons shot in Coimbatore District, South India.
M. L. R.

77. MORRIS, R. C.—Disappearance of jackals. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 117, (1938).

The author mentions the recent disappearance of jackals in the Coimbatore District (Madras Presidency) where these animals had been very numerous up to three or four years ago. He suspects that the disappearance was due to the appearance of severe rinderpest in cattle of that area on which the jackals of course fed.
M. L. R.

78. MORRIS, R. C.—On whistling of bison. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 117, (1938).

The author points out that the whistling sound made by the bison (*Bibos gaurus*) is always made by a *bull* during the breeding season (October-November to February-March).
M. L. R.

79. MORRIS, R. C.—Behaviour of Gaur or Indian Bison. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 325, (1938).

The author describes the curious behaviour of the Gaurs when their attention is concentrated on something which has aroused their excitement. In one case the bull's attention was concentrated on a bear close to it. When the bear was shot, the Gaur did not move for several minutes but stood staring at the dead bear, and finally walked away slowly.
M. L. R.

80. **Morris, R. C.**—Measurements of tiger, panther, bison and sambar. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 555, (1938).

The author gives the measurements of eight tigers, nine panthers, two bisons and one sambar shot in South India.

M. L. R.

81. **Morris, R. C.**—'Stamping grounds' and 'sore neck' in Sambar. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 560, 561, (1938).

The author opines that the cleared patches of ground or 'stamping ground', often found at the base of a tree or in the open, are made by stags during the breeding season in order to attract females.

In the author's opinion the 'sore neck' of sambar is of glandular origin.

M. L. R.

82. **Mukherjea, N. C.**—Studies in Indian snake venoms. *Science and Culture*, IV, pp. 156–159, (1938).

The author gives a short classification of the snakes and describes the indigenous method of extraction of venom, the minimum lethal dose, its physiological action and the therapeutic uses of snake venom.

M. N. A.

83. **Mustill, F. J.**—A large Indian elephant. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 324, (1938).

The author records a tuskless male elephant shot in Burma which measured 10 ft. 8 in. from the shoulder to the forefeet.

M. L. R.

84. **Mustill, F. J.**—The use of firework or rocket cartridges in the protection of crops. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 326, 327, (1938).

The author reports that in Burma the use of rocket cartridges was not a success in the protection of crops against such animals as elephants.

M. L. R.

85. **Naik, R. N.**—Duration of immunity following goat-virus vaccination in cattle. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 103–112, (1938).

The author finds that the duration of immunity conferred against rinderpest-virus by goat-blood-virus vaccination in cattle in the Bombay Presidency is at least five years.

M. L. R.

86. **Nangpal, H. D.**—Effect of bollworm attack on the number of seed, lint weight, seed weight and ginning percentage of clean locks in partially damaged bolls. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 184, 185, (1938).

87. **Nangpal, H. D., Nadkarni, N. T.** and **Krishnaswami, T. E.**—Incidence of spotted bollworm attack on cotton at Parbhani (Hyderabad-Dn.). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 185, (1938).

88. **Osmaston, F. C.**—Ticks. *Indian Forester*, LXIV, pp. 296, 297, (1938).

In this correspondence the writer solicited from the Forest Research Institute, Dehra Dun, cheap and effective measures for combating the depredations of certain organisms supposed by him to be ticks. In reply, Dr. Beeson remarked upon the absence of the true identity of the organisms involved, which in his opinion were either nymphal ticks or mites. Nevertheless, Dr. Beeson has suggested as a useful preventative against the attacks of nymphal ticks and mites the following ingredients made up as an ointment, which may be modified to suit individual taste:—'To mustard oil as a base small quantities of citronella oil and/or kerosene, camphor oil, iodoform and carbolic oil are added; after rubbing in the oil mixture, dust with flowers of sulphur or pyrethrum powder'. With a view to dislodging attacked mites, Dr. Beeson has advocated the use of a strong solution of salt or soda in bath water for some species and sulphur ointment, carbolic soap or weak carbolic oil for the others. He has also proposed weak carbolic, weak ammonia or soda solution for cases of irritation.

S. R.

89. PHILLIPS, W. W. A.—The mating of the moth *Phassus purpurascens* Moore. *Spol. Zeyl.*, XXI, pp. 63, 64, 1 pl., (1938).

The author records the find of a pair of Hepialid moths, *Phassus purpurascens* Moore, taken *in coitu* and found hanging from the tip of a bamboo spray in a steep hill-side jungle at Gammasluwa, 3,350 ft., East Matale Hills, Ceylon. A photograph of the moths, as first discovered, is included.

S. R.

90. PHYTHIAN-ADAMS, E. G.—Measurements of tigers shot in the Nilgiris. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 553, (1938).

The author gives the measurements of twelve tigers (7 ♂♂ and 5 ♀♀) shot during 1925–37 in the Nilgiris, South India.

M. L. R.

91. PHYTHIAN-ADAMS, E. G.—Measurements of panthers. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 554, (1938).

The author gives the measurements of 38 panthers shot in South India.

M. L. R.

92. PINCKNEY, P.—Shooting in Sikkim. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 10–20, (1938).

This is part of the author's diary of a shooting trip in Sikkim. All kinds of things are mixed up in it.

M. L. R.

93. PRASHAD, B.—The bearing of the domestication of animals on human civilization, with particular reference to India. *Science and Culture*, III, pp. 408–416, (1938).

The author gives a detailed account of the relationship between the domestication of animals and the growth of human civilizations. He points out that in one of the earliest known civilizations, *viz.*, Babylonian (5000 B.C.) and in the Indus Valley Civilization (3250 B.C.) the domestication of animals was already a well-known art. Various theories regarding the actual mode of domestication and the selection of animals to be domesticated from amongst the wild ones are discussed. The author opines, with Duerest, that the agricultural stage of human development must have preceded that of cattle breeders. It is pointed out that the earliest known animal companion of man was the dog. The author finally gives an account of the domestic animals in the Indus Valley Civilization. These were: the cat, dog, ass, ox, buffalo, goat, sheep, pig and camel.

M. L. R.

94. PRATER, S. H.—Panther with abnormal feet. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 321, (1938).

The author mentions a panther from Cutch with two extra phalangeal bones and claws—twenty in all. He also calls attention to some previously known examples of such abnormalities.

M. L. R.

95. **Pruthi, H. S.**—The cotton white-fly as a vector of the leaf-curl disease of tobacco. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 191, (1938).

96. **Pruthi, H. S.** and **Bhatia, H. L.**—Some observations on the bionomics and control of fruit fly pests in the N.-W. Frontier Province. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 187, (1938).

97. **Rao, H. S.**—Observations on the growth and habits of the Gastropod mollusc, *Pyrazus palustris* (Linn.), in the Andamans. *Rec. Ind. Mus.*, XL, pp. 193–206, (1938). [Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 163, (1938).]

The author has made an extensive study to determine the age and the rate of growth of shells of various sizes of *Pyrazus palustris* (Linn.) occurring in the vicinity of Port Blair, Andamans. He has described in detail the various methods of study, *viz.*, the 'annual ring' and the 'majority size' or 'age-group' methods usually adopted for the study, and has also discussed at some length the habits, habitat, breeding and distribution of this species. He has demonstrated the fact that the growth of the young shells under laboratory conditions is rapid and closely approximates to that of animals in nature; the loss of weight in specimens kept in captivity is due to want of food.

M. L. R.

98. **Rao, Y. Ramachandra** and **Bhatia, D. R.**—A preliminary note on the probable existence of seasonal migration among the solitary phase individuals of *Locusta migratoria* in North-West India. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 174, (1938).

99. **Roonwal, M. L.**—The frightening attitude of a desert mantid, *Eremiaphila braueri* Kr. *Proc. Roy. Entom. Soc. Lond.* (A), XIII, pp. 71, 72. (Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 181, (1938).)

The author describes, from observations made at Pasni on the Baluchistan Coast, the peculiar frightening attitude adopted by *Eremiaphila braueri* Kr. when chased by an enemy. The mantid at first ran fast for some minutes, then suddenly turned round, unfolded its wings and stood up on its hind-legs like a performing bear. When the enemy moved around the insect in a circle, the latter also turned round and always kept facing the enemy. This went on for over twenty minutes, after which, on the enemy remaining quiet, the mantid assumed its normal horizontal position on the ground, and walked away. Distinct vision of the mantid was estimated as not extending beyond about 15 feet. The food of the mantid was found to be desert ants. The colour of the elytra and wings, which play an important rôle in the frightening attitude, is described in detail.

M. L. R.

100. **Russel, H. G.**—Behaviour of Gaur or Indian Bison (*Bibos gaurus*). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 325, 326, (1938).

The author reports several instances in his experience in South Indian jungles when the Gaur showed no fright at the sight of men.

M. L. R.

101. **Roy, D. N.**—On the control of malaria mosquitoes in Bengal by the use of predacious fish and on the habits of two of them. *Journ. Malaria Inst. Ind.*, I, pp. 405–416, (1938).

The habits of *Panchax panchax* and of *Barbus phutunio* in relation to the control of malaria mosquitoes in rural Bengal were studied in the laboratory and in the field. Under natural conditions in tanks and ponds they were found to be ineffective as predators of mosquito larvae, as the diet includes a variety of small arthropods, their eggs and larvae and plant cells. Mosquito larvae were found in only 2 per cent of the fish examined for their stomach contents. A larval survey in Contai (District Midnapur) during May to July showed that anopheline larvae were obtained at the rate of 5 per dip per tank in the presence of *P. panchax*, as against 7 per dip where this fish was absent. Corresponding figures were obtained in August. Statistically such variation in the number of larvae caught per dip in tanks where this fish was present and where it was absent was found to be insignificant. In the laboratory *Panchax* feeds voraciously on larvae. *B. phutunio*, a smaller and less hardy species, preys more readily on *Daphnia* and *Cyclops* and is likewise incapable of attacking larvae in the presence of aquatic vegetation. In discussing this method of malaria control it is pointed out that its success depends on the elimination of the carrier species. A comparison with the figures obtained in Java where such method has been successfully applied shows that the relative number of fish and mosquito larvae is a condition which is fulfilled in Bengal, though the conditions under which fish is used in that country are different from the conditions existing here. The varied diet of these fish and the conditions under which *A. stephensi* breeds in Calcutta are other factors suggesting that the use of fish is limited in the control of malaria in Bengal. D. N. R.

102. ROY, D. N.—On the number of eggs of the common house-frequenting flies of Calcutta. *Ind. Journ. Med. Res.*, XXVI, pp. 531–534, (1938).

There is no information available on the number of eggs laid by any species of Indian muscoid flies. The author's experiments with *M. vicina*, *M. nebulo* and *Chrysomyia megacephala*, three of the common house-frequenting muscoids, have shown that the number of eggs laid are on an average 97, 75 and 182 respectively. The method adopted is the counting of eggs in ovaries of gravid females, which seems to be quite reliable in determining the number laid in a batch. During the winter season a lesser number of eggs are usually laid. *Musca domestica* and *Musca vicina*, though they resemble each other externally, differ in their fecundity. D. N. R.

103. SAHAI, L.—Rhinosporidiosis in equinis. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 221–224, (1938).

The author describes a case of rhinosporidiosis in a country-bred pony at Bargarh (Sambarpur District, Orissa). The cawliflower-like growth in the nasal cavity of this pony showed cysts and sporangia of *Rhinosporidium*. M. L. R.

104. SAPRA, A. N.—Preliminary studies on the biology of the mite (*Tetranychus* sp.) *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 187, 188, (1938).

105. SEN GUPTA, S. C.—Does the elephant procreate in captivity? *Indian Forester*, LXIV, pp. 723–734, (1938).

There existed, since ancient days, a curious belief that elephants rarely breed in captivity. The origin of the belief is not far to seek. The large numbers of elephants employed in those days used to be tied up after their specified work and were not allowed to mix freely. In the Andamans captive elephants breed frequently. The rule of one calf at a birth has been disproved, as an elephant gave birth to two sets of twins in two successive pregnancies. The article discusses the two factors of freedom and nutrition which are essential for the health and breeding of elephants. The possibility of a balanced diet for elephants is also discussed. S. C. S. G.

106. SEN, P.—A Note on the overwintering of the House Fly, *Musca domestica*. *Ind. Journ. Med. Res.*, XXVI, pp. 535, 536, (1938).

It is suggested by the author that the House Fly, *Musca domestica*, found in the Indian hills does not hibernate in winter for, as he has observed, 'the ovarian development would have been suspended and the flies would be provided with a reserve store of fat'. Moreover, the sexes of the flies caught and examined in Muktesar during the winter season by the author were in the ratio of 2 males to three females. In typical hibernating species such as *Pollenia rudis* and others only females have been recorded. S. R.

107. **Sen, S. K.**—Insects in relation to disease of domesticated animals. *Agric. & Live-stock in India*, VIII, pp. 235–244, (1938).

In this paper, an endeavour is made to develop the thesis that the adoption of measures designed to combat insect pests of live-stock assumes a position of fundamental importance in Veterinary Science by reason of the fact that a distinctive feature of this science consists in the application it makes, on utilitarian grounds, of the principles of disease prevention, as opposed to disease cure. The mechanical and cyclical methods by which disease is transmitted by insects are briefly explained and examples are given to illustrate the fact that insects are capable of conveying disease-agents belonging to widely different categories, such as a virus, a bacterium, a protozoan or a worm. A reference is made to the formidable nature of the problem of devising combating measures against these vectors, in view of their numerical strength, and their power of flight and concealment. The paper concludes by stressing the obvious futility of waging a continuous war against insect-borne diseases without taking into account the insects themselves. S. K. S.

108. **Seshaiya, R. V.**—An instance of 'viviparity' in *Mabuya carinata* (Schn.). *Journ. Bombay Nat. Hist. Soc.*, XL, p. 132, (1938).

The author reports having found in the body of the Common Striped Skink, *Mabuya carinata* (Schn.), eggs with embryos in a fairly advanced state of development. This he presumably regards as an instance of viviparity. M. L. R.

109. **Sevastopulo, D. G.**—The early stages of Indian Lepidoptera. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 391–408, (1938).

This paper is a continuation of the series of descriptions of the early stages of the Lepidoptera that have been published by the author from time to time. It deals with some of the Indian species of both butterflies and moths. Reference to the species together with the names of their food plants are added. S. R.

110. **Sharif, M.**—Diseases transmitted by the Indian species of ticks, and the possibility of their prevention through biological control. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 353–366, (1938). [Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 162, (1938).]

The author reviews the existing information on tick-borne diseases in other countries and particularly refers to records of the diseases transmitted by ticks found in India. As the possible biological control of ticks in India the author comments upon the predators and parasites of ticks in other countries. With regard to the former in India, he states that he has seen the common crow and myna feeding on ticks on cattle and suggests that the Chalcidoid Hymenopteran, *Huntrellus hookeri* How., which is found in India, should be used as a possible parasite. The author concludes with: (1) a list of species of ticks (with their usual hosts) which are of considerable economic importance in India and which attack domestic animals in large numbers, (2) a list of Indian species (with their usual hosts) which are found on domestic animals, but are of comparatively less economic importance, and (3) a list of the Indian species that have been involved in the transmission of diseases noted against their names in India or in other countries.

S. R.

111. **Sharif, M.**—A proposal to advance the teaching and research in entomology in India. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 508–512, (1938).

112. **Sharma, K. C.**—Observations on the sugarcane borer incidence at the Government Sugarcane Farm, Jorhat. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 183, 184, (1938).

113. **Shebbeare, E. O.**—The identification of the poisonous snakes of India and Burma. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 21–29, (1938).

This is a reprint from the 'Forest Pocket Book' (1937 ed.) issued by the Govt. of India. It deals with the differentiation between poisonous and non-poisonous snakes, and also gives the treatment for snake-bite.

M. L. R.

114. **Shirlaw, J. F.**—On the relationship between 'Lahore canine fever' and 'tick fever' on dogs due to *P. gibsoni* infection, with observations on their pathology and haemocytology. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 293–316, (1938).

The author shows the identity of the diseases known under the names of 'Lahore Canine Fever', 'Canine Typhus Fever' and 'Canine Enteric Fever'. He further shows that this disease is a 'tick fever' caused by *P. gibsoni* (full generic name not given).

M. L. R.

115. **Shirley, G. S.**—Ticks. *Indian Forester*, LXIV, p. 563, (1938).

Written in reference to Osmaston's article on ticks published earlier in this volume of the Journal, the author has given here a preventative for tick bites. It is as follows:—'Drill leggings (double cloth, buttons down the side, protected by a fly cover) well sprinkled or sprayed with kerosene oil. A dusting powder, half naphthaline and half boracic powder, applied to the body and also round the waist between shirt and trousers.'

S. R.

116. **Singh, G.**—Studies in the phototropic response of the larvae of *Trogoderma khapra* Arr. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 181, (1938).

117. **Singh Deo, S.**—Curious Behaviour of wild dogs and a panther at a kill. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 115, (1938).

The author observed that a panther did not mind the presence of two wild dogs near a kill which was tied up to attract the panther.

M. L. R.

118. **Shrivastava H. D.**—Helminthology in relation to veterinary science. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 113–118, (1938).

The author records the utility of helminthological studies in relation to veterinary science. He enumerates the different kinds of damage caused by helminth parasites of various animals, and suggests the need of a systematic study of the different groups of parasites with their life-history.

M. N. D.

119. **Srivastava, H. D.**—A study of the life-history and pathogenicity of *Cotylophoron cotylophoron* (Fischoeder, Stiles and Goldberger) of Indian ruminants and a biological control to check the infestation. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 381–386, (1938).

The author records the results of his experiments on the life-cycle of the Amphistome, *Cotylophoron cotylophoron*, found in the rumen of goats and sheep. Extensive laboratory experiments were carried out to study and collect the various stages of the life-history of the worm and the after-effects of infection have been studied on infected animals. A check to its propagation is also suggested.

M. N. D.

120. **Subramanyam, T. V.**—Protective adaptation among some Indian spiders. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 477–485, (1938).

The author has outlined the protective and aggressive significance in the methods displayed by certain sedentary and roving spiders in the capture of their prey and in concealing themselves from enemies.

S. R.

121. **Thompson, N. T. S.**—Jackals (?) and a captive panther. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 321, 322, (1938).

The author describes the case of a captive panther in Travancore allowing its cage to be raided at night by a couple of jackals or by wild dogs for food, without attempting to interfere with the raiders. The panther appeared to be cowed down on the morning after the raid.

M. L. R.

122. **Tutelin-Nolthenius, A. C.**—Unusual mauling by a leopard. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 116, 117, (1938).

The author describes the mauling of a human being by a leopard in Ceylon, and points out that mauling by leopards is unusual.

M. L. R.

123. **Tutelin-Nolthenius, A. C.**—A note on our Yala Sanctuary. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 135, 136, (1938).

The author briefly describes a tour he conducted to the Yala Sanctuary in Ceylon.

M. L. R.

124. **Venketasubban, C. S.**—Studies and observations on the incidence and control of *Spodoptera mauritia* (Bosid) a major pest of rice in Cochin. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 183, (1938).

125. **Whistler, H.**—Notes on bird collecting. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 86–96, (1938).

This is the first of a series of articles by the author on bird collecting in India, and contains some general observations on the subject useful for collectors.

M. L. R.

126. **Whistler, H.**—Notes on bird collecting. Part II. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 135–158, (1938).

This is the second and concluding portion of the author's article (Part I appeared in the same Journal, Vol. XII, pp. 86–96, 1938) on hints on the collecting and skinning of birds. It deals with the treatment of the freshly shot bird, the preparation of the bird skin and the preservation of nestlings.

M. L. R.

127. **Williams, C. B.**—The migration of butterflies in India. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 439–457, (1938).

The author reviews here the records he had been able to trace of the migration of butterflies in India. He has tabulated the records for North India, the Himalayas, Kodaikanal and the rest of India. A list of the species that are found migrating in India is given, together with a diagram of the main flight routes. A coloured plate of some Indian migrant butterflies is also included.

S. R.

128. **Wood, H. S.**—Observations on the tiger and its shikar. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 97–105, (1938).

This is a further instalment by the author on his personal observations on tigers and tiger-shooting in Assam. Notes on the mode of stalking, local trapping and the number of young ones produced by tigers are included. M. L. R.

129. **Wood, H. S.**—Observations on the tiger and its shikar. Part III. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 158–165, (1938).

This is the third part of the author's article on his observations on tiger shooting in Assam. It deals with *machan* shooting, the bait and the behaviour of various jungle animals in the presence of a tiger in their vicinity. M. L. R.

130. **Wood, H. S.**—Observations on the tiger and its shikar. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 53–58, (1938).

This is a continuation of the author's article (from Vol. XII, p. 165, not p. 105 as stated in the original, of the same journal) on his experiences of tiger shooting in Assam.

M. L. R.

131. **Yandle, A. T.**—Note on the python. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 129–131, (1938).

The author observed a case in Assam in which a python had swallowed a large goat and was apparently going to ingest it without crushing the bones. M. L. R.

Morphology
(including Cytology).

132. **Aiyar, R. G.**—On the nephridia of *Prionospis cirrifera* Wiren. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 159, (1938).

133. **Aiyar, R. G.** and **Nalini, K. P.** (Miss)—Observations on the reproductive system, egg-case, embryos and breeding habits of *Chiloscyllium griseum* Müll. and Henle. *Proc. Ind. Acad. Sci.* (B), VII, pp. 252–269, (1938).

The complete life-history of *Chiloscylium griseum* from Madras is described in detail. A description of the reproductive system and the egg-case is given. There is a single ovary and a common oviducal opening. The nidamental glands are well developed. An account of the different stages of development is given. The breeding period commences probably in January and extends over several months. Eggs are probably liberated in pairs, the two eggs of every pair escaping in quick succession. The time taken for development of the egg into a full-grown embryo before it is liberated is very short, being 2½ to 3 months, unlike the very much longer periods taken in colder regions by allied forms.

AUTHORS' SUMMARY.

134. **Aiyar, R. G.** and **Nalini, K. P.** (Miss)—Observations on the reproductive system, egg-case and embryos of *Chiloscyllium greseum* Müll. and Henle. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 164, (1938).

135. **Awati, P. R.**—A ciliated apparatus in the larva of *Echiurus*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 160, (1938).

136. **Awati, P. R.**—The ciliatory system in *Thalassema bombayensis* and *Bonellia viridis*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 160, (1938).

137. **Awati, P. R.**—A short note on the ciliated apparatus in an *Echiurus* larva. *Journ. Univ. Bombay*, VI, pp. 92–103, (1938).

This paper demonstrates the working of the ciliated apparatus of an *Echiurus* larva. For this purpose a detailed histological study was made. The apparatus consists of two tubules intimately joined together. Through one of the tubules water is sucked into the stomach and through another the fluid is taken out from the stomach into the intestine and thence to the outside. This apparatus is useful when the animal closes its mouth in response to some outside stimuli.

P. R. A.

138. **Awati, P. R.** and **Kshirsagar, G. R.**—On the anatomy of *Lingula* sp. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 159, (1938).

139. **Ayyangar, H. N. C.**—Investigations on the course and distribution of the nerves supplying levator anguli scapuli and rhomboideus muscles and the formation of the phrenic nerve in the ox, with observations on certain anatomical deviations. *Govt. of India Publication*, Delhi, pp. 1–60, 50 figs., (1938).

The author finds the following sources of nerve supply to the parts indicated: (i) levator anguli scapuli from 5th to 8th cervicals; (ii) rhomboideus from 5th to 6th cervicals. Several other anatomical findings are also described.

M. L. R.

140. **Bahl, K. N.**—The nephridia of earthworms of the genus *Tonoscolex*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, p. 160, (1938).

141. **Bal, D. W.**—Sexual dimorphism in *Tetradon* sp. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 167, (1938).

142. **Batra, R. N.**—Correlation of eye-stripes with instars of *Schistocerca gregaria* Forsk. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 176, (1938).

143. **Bhaduri, J. L.**—An abnormal renal-portal vein in an American bullfrog *Rana catesbeiana*. *Anat. Anz.*, LXXXVI, pp. 65–67, (1938).

The author shows that in a ♂ *Rana catesbeiana* an abnormal vein opened into the right renal portal vein.

M. N. D.

144. **Bhaduri, J. L.**—Observation on the course of the facial vein and the formation of the external jugular vein in an American bullfrog *Rana catesbeiana*. *Anat. Anz.*, LXXXVI, pp. 170–172, (1938). [Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 168, (1938).]

The author shows that the facial veins of *Rana catesbeiana* take a course more or less identical to that of Indian Ranids. One of the veins which is formed by the union of the facial and intermandibular vein has been termed the facio-mandibular vein.

M. N. D.

145. **Bhatia, M. L.**—On the metamerism of the Indian leech, *Hirudinaria granulosa*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 161, (1938).

146. **Bhatia, M. L.**—On the structure of the nephridia and 'funnels' of the Indian leech *Hirudinaria*, with remarks on these organs in *Hirudo*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 161, (1938).

147. **Bhatia, M. L.**—On structural variations in the Indian leech *Hirudinaria granulosa*. *Curr. Sci.*, VI, pp. 439–442, (1938).

The author records some interesting variations in the structure of various organs in *Hirudinaria granulosa*.

M. N. D.

148. **Bhattacharya, D. R.** and **Srivastava, M. D. L.**—The yolk-nucleus of Balbiani. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 170, (1938).

149. **Clement, R.** (Miss)—On the cytoplasmic inclusion in the oogenesis of *Lepus cunniculus*. *Allahabad Univ. Studies*, XIV, pp. 137–174, (1938).

The author describes the cytoplasmic inclusions in the oogenesis of the rabbit, and also deals with follicular atresia, development of the graffian follicle and zona pellucida along with the cytoplasmic inclusions.

M. N. D.

150. **Das, B. K.**—On the bionomics, structure and physiology of certain air-breathing Gobies, *Periophthalmus koelrenteri* (Pall.) and *Boleophthalmus boddaerti* (Pall.). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 166, (1938).

151. **Das, S. M.**—A case of commensalism between a lamellibranch and a monascidian. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 164, (1938).

152. **De Mello, I. F.** and **Lobo, L.**—On the morphology and identification of a trypanosome found in the blood of *Hemidactylus brooki* Gray. *Proc. Ind. Acad. Sci.* (B), VII, pp. 104–108, (1938).

First of all the necessary correction in the name of the host is made. The general morphology and the characters of this particular trypanosome as well as the characters by which it is distinguished are given. It is found in the blood of *Hemidactylus brooki*.

K. K. N.

153. **Dhillon, B. K.**—The arterial system of the mud turtle, *Lissemys punctata*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 169, (1938).

154. **Fraser, A. G.**—Observations on the bionomics of *Panchax lineatus* Cuvier and Valenciennes, with special reference to its larvicidal propensities. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 96–99, (1938).

The author notes that pieces of water inhabited by *Panchax lineatus* C. & V. were found to be free of mosquito larvae. He also observed that *P. lineatus* can live in very

foul waters and that it can subsist on aerial respiration alone for considerable periods. Moreover, a tentative hypothesis concerning the function of the silver spot on the dorsal surface of the head is advanced, and it is surmised that the spot is used for attracting insects.

At the end of the article Dr. S. L. Hora appends a note on the significance of Mr. Fraser's observations on the bionomics of *P. lineatus* and refers to the larvicidal propensities of *P. panchax* (Ham.) and *Rasbora labiosa* Mukerji.

S. L. H.

155. GNANAMUTHU, G. P.—Buccal participation in the respiratory mechanism of the Chelonia. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 168, (1938).

156. GOPALACHARI, T. K.—A preliminary note on the stomach and the probable function of the caecum of *Pila*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 163, (1938).

157. GUPTA, S. N.—Mass breeding of *Microbracon greeni* Ashm.—an ectoparasite of the larva of *Eublemma amabilis* Moore, predacious on lac. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 188, (1938).

158. GUPTA, S. N.—Effect of different sugars on the longevity of *Microbracon greeni*, Ashm. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 178, (1938).

159. HAFIZ, H. A.—On the habits and life-history of *Amphipsyche indica* Martynov. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 182, (1938).

160. HAQ, A.—The influence of temperature on the rate of growth and size in the Desert Locust (*Schistocerca gregaria* Forsk.). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 180, (1938).

161. HILL, W. C. O.—The external and radiological anatomy of a foetal Asiatic Elephant. *Spol. Zeyl.*, XXI, pp. 31–43, (1938).

The author describes the external features of a mid-term foetus of the Asiatic Elephant, *Elephas maximus*, as also its skeleton as studied radiographically. A comparison of the foetal mandible with a series of post-natal stages of this bone suggests a repetition of its phylogenetic history. The state of ossification of the limbs is less advanced than in other Ungulates and is more in keeping with the development of the human skeleton.

M. L. R.

162. HILL, W. C. O.—Studies on the cardiac anatomy of the elephant. II. The heart and great vessels of a foetal Asiatic Elephant. *Spol. Zeyl.*, XXI, pp. 45–61, (1938).

The author describes, for the first time, the foetal cardiac anatomy of the Asiatic Elephant, *Elephas maximus*. The foetal heart resembles, in all essential points, the adult heart and confirms the primitive nature of the organ. Among the more important primitive features, the author describes the following: (i) The great transverse breadth of the organ; (ii) the relatively large size and globular form of the ventricle; (iii) the apical bifurcation; (iv) the absence or incipient nature of the atrial appendages; and (v) the poor differentiation of the papillary muscles. The author also points out the differences between the foetal cardiac anatomy of the Asiatic and the African Elephants.

M. L. R.

163. **Hora, S. L.**—Animal ecology of torrential streams. *Current Science*, VI, pp. 437–439, (1939).

The author defines Ecology as a branch of biological science which deals with the responses of organisms to the physical and biological factors in their respective environments, and indicates that for the study of 'adaptations' it is essential to have a fair knowledge not only of the structure but also of the ecology of the organism concerned. A brief account of the ecology of the torrential fauna is given and the author enumerates several instances to illustrate the correlation that exists between the organisation of an animal and the factors that constitute its environment. AUTHOR'S SUMMARY.

164. **Hora, S. L.**—Notes on the biology of the freshwater Grey-Mullet, *Mugil corsula* Hamilton, with observations on the probable mode of origin of aerial vision. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 62–68, (1938). [Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 165, (1938).]

The author records a series of observations made by him on the bionomics of the Grey-Mullet, *Mugil corsula* Ham., at the Calcutta Waterworks at Pulta. In separate sections observations are made on the locomotion, aerial vision, respiration, feeding and breeding of the species. Towards the end the author discusses the probable mode of evolution of aerial vision in fishes and infers that the initial stages in the development of aerial vision were probably induced by the desire of the fish to feed on floating material. In this connection reference is also made to the bionomics of *Periophthalmus*, *Periophthalmodon*, *Boleophthalmus* and *Anableps*. AUTHOR'S SUMMARY.

165. **Iyengar, M. O. T.**—Egg of *Anopheles leucosphyrus* Don. *Journ. Malaria Inst. India*, I, pp 353, 354, (1938).

The egg of *Anopheles leucosphyrus* Dönitz, which was hitherto unknown, is described. It is of the whale-back type with characteristic reticular ornamentation on the lower surface. In common with other Indian species of the *Neomyzomyia* group, it has prominent bosses at the anterior and posterior ends of the upper surface, polygonal markings on the lower surface, and a serrated contour of the floats when viewed from above; the floats are well separated from the deck and the number of float ridges is between 17 and 20.

M. O. T. I.

166. **Job, T. J. and Jones, S.**—Studies in the development of the Indian Garfish, *Tylosurus strongylurus* (van Hass.) with notes on young stages of *Hemirhamphus gaimardi* Cuv. & Val. *Rec. Ind. Mus.*, XL, pp. 245–253, (1938).

The embryonic and larval development of the Indian Garfish has been described in detail. Interesting features observed are the filaments for anchoring the eggs and the presence of one or more clear vesicles, in the embryonic stages, projecting into the yolk. These are presumably the 'compound vesicles'. In the latter part of the paper, three post-larval stages of *Hemirhamphus gaimardi* bridging the gap between the adult fish and the oldest post-larval stage of this fish described by Bhattacharya from Chilka Lake have been figured and described. T. J. J.

167. **Jones, A. E.**—On the differences between *Lycaenopsis huegelii huegelii* and *Lycaenopsis ladonides gigas*. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 134, 135, (1938).

The author has shown by means of photographs of the egg, larva, pupa and adult of *Lycaenopsis huegelii huegelii* and *L. ladonides gigas* that the only difference between the two species lies in their markings—the markings being somewhat clearer in *L. ladonides gigas* than in *L. huegelii huegelii*.

Prinsepia utilis Boyle, a thorny shrub which often grows to a height of 4 to 5 feet and is common in the Simla Hills at elevations of between 5,000 feet and 7,500 feet, is recorded as the food plant of the two species. S. R.

168. **Jones, A. E.**—Description of the larva of *Eterusia* (*Soritia*) *leptalina* Koll. (Zygaenidae). *Journ. Bombay Nat. Hist. Soc.*, XL, p. 578, (1938).

The author briefly describes the caterpillar of the moth *Eterusia* (*Soritia*) *leptalina* Koll., which feeds on the foliage of the raspberry, *Rubus macilentus*, found in Simla. He also describes its cocoon.

S. R.

169. **Kapur, S. S.**—The mechanism of oviposition in the *Ak*-grasshopper (*Poecilocerus pictus*). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 176, (1938).

170. **Khatib, S. M. H.**—Four cases of abnormalities in the blood vascular system of the common Indian frog (*Rana tigrina* Daud.) *Proc. Ind. Acad. Sci.* (B), VII, pp. 277–285, (1938).

The author describes the following abnormalities: (i) Two arterial branches arising close together from the systemic arch. (ii) Absence of right anterior vena cava. (iii) Presence of an anastamosing vessel joining the left external jugular vein with the innominate and subclavian veins of the same side. (iv) The inter-renal portion of the post-caval vein does not extend beyond the anterior half of the two kidneys.

M. L. R.

171. **Krishnamurti, B.**—A microscopical study of the development of *Trichogramma minutum* Riley (the egg-parasite of the sugarcane borers in Mysore) and its parasitisation of the eggs of *Corcyra cephalonica* Staint (the flour-moth employed in the mass production of *Trichogramma*). *Proc. Ind. Acad. Sci.* (B), VII, pp. 36–40, (1938).

In his work on the development of *Trichogramma minutum* Riley, an egg-parasite of the stem-borers of sugarcane in Mysore, the author records the life-history, host preference, behaviour of the parasite and its importance. The five plates which accompany this study show some stages in the embryonic development of the parasite.

S. R.

172. **Lazarus, M.**—A rapid method of mosquito dissection. *Journ. Malaria Inst. Ind.*, I (3), pp. 267, 268, 3 figs., (1938).

The anaesthetised mosquito is dropped into absolute alcohol for a moment and then removed to a drop of normal saline on a slide. The usual procedure of nicking the membrane in front of the last abdominal segment is by keeping the head fixed and the thorax pulled sideways, as a result of which the whole intestinal tract, with the glands, comes out through the thorax in one piece. The head is detached at the neck. This method was applied to 23,000 Anophelines and 50 to 55 specimens could be dissected in an hour.

AUTHOR'S SUMMARY.

173. **Mathur, C. B.**—Copulation and allied phenomena in the Desert Locust (*Schistocerca gregaria* Forsk.). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 174, (1938).

174. **Mathur, C. B.**—An extra hopper stage in the Desert Locust (*Schistocerca gregaria* Forsk.). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 177, (1938).

175. **Mathur, L. P.** and **Sharma, M.**—Observations on the abnormalities in the common Indian frog, *Rana tigrina* Daud. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 182–187, (1938).

The authors describe the following abnormalities: (i) Two dorso-lumbar veins. (ii) The spleen divided into two distinct lobes. M. L. R.

176. **Mehrotra, S. N.**—Spermatogenesis in the common Indian pigeon, *Columba livia domestica*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, 171, (1938).

177. **Misra, A. B.**—Chromosomes of the American bullfrog, *Rana catesbeiana*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 169, (1938).

178. **Misra, A. B.** and **Rao, S. R. M.**—Life-history and biology of *Monophlebus stebbingi*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 181, (1938).

179. **Mookerjee, H. K.**—On the development of the vertebral column in *Salamandra salamandra* (Linn.). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 167, (1938).

180. **Mookerjee, H. K.**—Determination of sex from the external features of *Labeo rohita*, Günther and *Cirrhina mrigala* Cuv. & Val. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 41, 42, (1938).

According to the author a specimen of *Labeo rohita* is a male when its pectoral fin is longer than or equal to the anal. In the females the pectorals are shorter than the anal. Moreover, in the females the area surrounding the vent becomes reddish and swollen during the breeding season. In *Cirrhina mrigala* the pectorals are longer than the anal in males, and equal to the anal in females. S. L. H.

181. **Mukerji, D.**—On the thoracic mechanism of the pulse beetle *Bruchus quadrimaculatus* Fabr. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 177, (1938).

182. **Mukerji, S.**—On the post-embryonic development of eye-stripes and their correlation with the number of larval instars in the life-cycle of *Schistocerca gregaria* Forsk. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 176, (1938).

183. **Nair, K. K.**—Changes in the internal structure of the air-bladder of *Eutropiichthys vacha* (Ham.), *Clupisoma garua* (Ham.) and *Ailia coila* (Ham.) during growth. *Rec. Ind. Mus.*, XL, pp. 183–187, (1938).

The author describes in detail the changes in form and internal structure undergone by the air-bladder of the Siluroid fishes, *Eutropiichthys vacha* (Ham.), *Clupisoma garua* (Ham.) and *Ailia coila* (Ham.) during growth and thereby emends, in several respects, the descriptions of this structure by Bridge and Haddon. S. L. H.

184. **Nalini, K. P. (Miss)**—Observations on the structure and function of the nidamental glands of *Chiloscyllium griseum* Müll. and Henle, with a note on the formation of the egg capsule. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 165, (1938).

185. **Nangpal, D.** and **Pregna, V. N. P.**—Length of life of pink bollworm moth and its correlation with temperature and humidity. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 179, (1938).

186. **Nath, V.**—The Decapod sperm. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 172, (1938).

187. **Panikkar, N. K.**—Studies on *Peachia* from Madras. *Proc. Ind. Acad. Sci.* (B), VII, pp. 182–205, (1938).

Both the larval stages and the adults of the genus *Peachia* are recorded from Madras. The adult anemone is described as a new species *Peachia tropica*.

The morphology of *Peachia tropica* is described. The anemone has a vermiform column, a five-lobed conchula and sixteen tentacles. The mesenteries consist of a primary cycle of six pairs and a secondary set of two pairs; they are arranged without distinction into macrocnemes and microcnemes. All mesenteries are fertile and have filaments. The siphonoglyph is completely separate from the actino-pharynx. The number of tentacles and disposition of mesenteries are unique features of *P. tropica* as compared to other species of the genus; the probable order of succession of mesenteries and tentacles in the light of this new arrangement is discussed.

The systematic relationships of the anemone are discussed. Parasitic larvae from *Aequorea pensile* are described and the development of the larva from the 4- to 12-mesentery stage is followed. The development of the oesophageal lobes, siphonoglyph and the conchula is described in detail. The conchula is developed from the base of the ventral oesophageal lobe. The larvae drop down after the 12-mesentery stage, when they are from 13 to 16 mm. long. The development of the second cycle of mesenteries and the related tentacles appear to take place only after the larvae have left the host. The influence of the parasitic life of the larvae on the adult structure of *Peachia* is discussed.

AUTHOR'S SUMMARY.

188. **Paul, M. D.**—Observations on the growth of the green mussel, *Mytilus viridis* L., in the Madras harbour. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 162, (1938).

189. **Pradhan, S.**—Neuromuscular study of the mouth-parts of *Coccinella septempunctata* with a comparison of the mouth-parts of carnivorous and herbivorous Coccinellids. *Rec. Ind. Mus.*, XL, pp. 341–358, (1938).

The author describes the chitinous structures, the musculature and the nervous supply of the mouth-parts of *Coccinella septempunctata.* He compares the chitinous structures of its mouth-parts with those of two herbivorous and four carnivorous species of Coccinellidae and adds a short description of the sense-organs situated on the mouth-parts. As a result of his studies the author records and interprets muscles of the designations *extensor of lacinia, cranial flexor of sub-galea* and *stipital flexor of sub-galea*; the first two were hitherto imperfectly known, while the last-named was not known at all. The study of nervous supply in the labial and maxillary palpi and the galea show these sense-organs to be olfactory in nature.

S. R.

190. **Pradhan, S.**—The alimentary canal of *Coccinella septempunctata* (Coleoptera) with some observations regarding the reassociation of Malpighian tubules. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 177, (1938).

191. **Rahimullah, M.**—On the structure and functions of the so-called pyloric caeca in two genera of fishes, *Lactarius* and *Osphromenus*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 166, (1938).

192. **Raichoudhury, D. P.** and **Sarkar, D. C.**—Effect of temperature and humidity on the mortality of the silkworm, *Bombyx mori* L. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 180, (1938).

193. **Rao, B. A., Sweet, W. C.** and **Subba Rao, A. M.**—Ova measurements of *A. stephensi* type and *A. stephensi* var. *mysorensis*. *Journ. Malaria Inst. Ind.*, I, pp. 261–266, (1938).

Average measurements of eggs of *A. stephensi* type and *A. stephensi mysorensis* are given. The averages of 4,707 ova from 105 type females were: 548 microns in length, 200 microns in breadth including floats, 290 microns in length of float; there were 18 ridges on one side of the float, and the floats covered 0·53 of the total length. Corresponding measurements of 6,916 ova of 147 *mysorensis* females were 477, 161 and 218 microns, 13·5 ridges on the float, and the floats covered 0·46 of the total length. Rearing *A. stephensi* type from larvae and mating them in the laboratory was not found to alter the average ova measurements, but such mating proved difficult in the case of *mysorensis*. *A stephensi mysorensis* resisted all attempts at colonisation and no generation beyond F_1 could be obtained, but *A. stephensi* type colonized easily in small cages and bred true in the main in its average egg measurements. The utility of *A. stephensi* type as a colony mosquito is noted.

W. C. S.

194. **Rao, H. S.** and **Hora, S. L.**—On the ecology, bionomics and systematics of the Blennid fishes of the genus *Andamia* Blyth. *Rec. Ind. Mus.*, XL, pp. 377–401, (1938).

The paper is divided into two parts. In the first part Rao deals with the ecology and bionomics of *Andamia* and in the second part Hora gives a systematic account of the two species known from the Andamans.

Under ecology and bionomics an account of the habitats of *Andamia*, its mode of locomotion, feeding habits, longevity and habits under laboratory conditions, effect of desiccation, aerial and aquatic respiration, respiration in diluted sea-water and in fresh water, and breeding and development are given. Under systematics the two species, one of which is new, are described in detail, with particular reference to the sexual dimorphism exhibited by them. A key for distinguishing males and females is given.

S. L. H.

195. **Rao, T. R.** and **Russell, P. F.**—Some field observations on the swarming and pairing of mosquitoes, particularly *A. annularis*, in South India. *Journ. Malaria Inst. India*, I, pp. 395–403, (1938).

Pre-nuptial swarms of *A. annularis* and of *A. subpictus* (or *vagus*?) were observed on several occasions just after sunset in Pattukkottai in the Madras Presidency. At the time of swarming the light intensity was never over 2·3 foot-candles and usually 1·6 to 1·9 foot-candles. The wind velocity was more than 120 feet per minute when swarming was vigorous. Judging by wing grades the swarming males were of all ages. Mating pairs were observed. Culicine swarms were seen not only in the evening but also at daybreak.

AUTHORS' SUMMARY.

196. **Ratnavathi, C. K.**—The spermatogenesis of *Clibanarius padabensis*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 171, (1938).

197. **Ray, H. N.**—On the nuclear structure of *Babesia bigemina* (Smith & Kilbourne). *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 183–186, (1938).

The author describes in detail the nuclear structure of the Indian strain of *Babesia bigemina*. The nucleus consists of karyosoma surrounded by a circlet of fine granules which give a positive Feulgen reaction. These fine granules are arranged at the periphery of an achromatinic nuclear membrane. The nucleus is situated at the narrow apical end of the pyriform body. A granule which is sometimes seen at the broad pole of the parasite, is two to four times the size of the karysoma and gives a negative Feulgen reaction. With iodine and Best's carmine this granule gives a faintly positive reaction for glycogen.

H. N. R.

198. Reddy, A. R.—The development of Anuran kidney. Part I. The development of the mesonephros of *Rhacophorus maculatus* Boulenger. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 249–265, (1938).

This is an important contribution to the development of the Anuran kidney. The author finds that: (1) The early Malpighian units arise from nephroblast vesicles of which 6–8 are developed. (ii) The early peritoneal funnel persists. (iii) The early Malpighian capsules and their tubules degenerate and disappear. (iv) The later Malpighian capsules arise from capsuloblast vesicles. (v) The formation of the rudiments of the early peritoneal funnels are regarded as pointing towards the urodelan ancestry of the mesonephros.

M. L. R.

199. Reddy, A. R.—The development of Anuran kidney. Part II. The development of the mesonephros of *Bufo melanostictus* Schneider. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 413–426, (1938).

The development in *Bufo* is fundamentally similar to that of *Rhacophorus* previously described by the author (*supra*). The Malpighian units arise from 10–13 nephroblast vesicles, while the straight tubules of the early Malpighian capsules arise from 13–15 condensations of the archinephric duct. The later Malpighian capsules arise from each capsuloblast vesicle. Both the early and the late peritoneal funnels establish a connection between the coelom and blood circulation.

M. L. R.

200. Roonwal, M. L.—Amplification of the theory of multiphased gastrulation among insects, with remarks as to its applicability to other arthropods. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 173, (1938).

201. Roonwal, M. L.—Some reversal changes among locusts and other Acrididae, and the probable importance of the third instar. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 173, (1938).

202. Scot, F. B.—Notes on Indian hawk moths. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 74–89, (1938).

The author gives the characteristic appearance and habits of hawk-moths (Sphingidae) which distinguish them from the other moths, and describes their life-history, some stages of which he figures. He includes notes on the colour and markings of the caterpillars, and records the distribution and food-plants of the species known in India. Plates of the caterpillars and adults of some Indian hawk-moths illustrate this article which is to be continued.

S. R.

203. Sen, S. K.—Further observations on the rôle of blood in ovulation in Culicidae. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 178, (1938).

204. Sen, P.—On some physico-chemical factors of the breeding places of *Anopheles sundaicus*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 179, (1938).

205. **Seshaiya, R. V.**—A note on *Eorrhachis trutta* (Blanford). *Rec. Ind. Mus.*, XL, pp. 13–16, (1938).

The author describes in detail the soft parts, especially the structure of the radula and the genitalia, of the mollusc *Eorrhachis trutta* (Blanford). H. C. R.

206. **Seshaiya, R. V.**—A further study of the digestive gland of some Melaniidae. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 163, (1938).

207. **Seshaiya, R. V.**—A preliminary note on the sex-chromosomes of *Paludomus tanschaurica* (Gmelin). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 170, (1938).

208. **Sharif, M.**—On the structure of the so-called 'penis' of the oriental catflea, *Ctenocephalides felis* subsp. *orientis* (Jordon). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 178, (1938).

209. **Sharma, M. I.**—The subcutaneous corpora adiposa in *Rana tigrina* Daud. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 405–412, (1938).

The author describes five localised adipose bodies under the skin of the frog—four on the ventral surface and one on the dorsal. M. L. R.

210. **Sibtani, S. M.**—Studies on the caudal autotomy and regeneration in *Mabuya dissimilis* Hallowell. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 63–78, (1938).

The author has studied the caudal autotomy and regeneration in the lizard *Mabuya dissimilis*. Among the more important findings are: (i) The lepidosis of the regenerated tail differs from that of the normal in the fewer number of scale rows, etc. (ii) The dermal scutes show inter-connecting bridges. (iii) The number of muscle bundles in the normal and regenerated tail alike is sixteen. (iv) There is no distinct autotomy septum in *Mabuya*. M. L. R.

211. **Soni, B. N.**—Observations on the bionomics of the ox warble fly (*Hypoderma lineatum* De Villers). *Ind. Journ. Vet. Sci. & Anim. Husb.*, VII, pp. 375–380, (1938).

The author has shown that over fifty per cent of the experimental hill bulls were infested with grubs of *Hypoderma lineatum*. The larvae take nearly fifty-one days to develop fully; the seasonal occurrence of the mature larvae of *H. lineatum* at Muktesar, where the enquiry was undertaken, is as late as the beginning of March, a departure from the recorded occurrence of the same species in other localities in India. *H. lineatum* is indigenous to Muktesar, as warble tumours are found in dairy cows and oesophageal larvae in bulls born and bred there. Previously recorded as having one annual brood, it has been observed during 1937 for the first time at Muktesar in the oesophageal forms towards the end of March and thereafter continuously for a period of almost seven months.

S. R.

212. **Subramaniam, M. K.**—Studies on the structure of the Golgi apparatus. IV. Endostyle of *Brachiostoma indicum* (Willey). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 170, (1938).

213. VANAJAKSHI, T. P.—Histology of the digestive tract of *Saccobranchus fossilis* and *Macrones vittatus*. *Proc. Ind. Acad. Sci.* (B), VII, pp. 61–79, (1938).

A detailed histological account of the digestive tract of *Heteropneustes* (= *Saccobranchus*) *fossilis* and *Mystus* (= *Macrones*) *vittatus* is given; it is based on the studies of sections with details of gross anatomy from fresh material. The author has paid particular attention to the epithelium of the different regions of the digestive tract and has described variations in the structures of different parts.

S. L. H.

214. VENKETASUBBAN, C. S. and IYER, N.—The high fecundity of Epilachna beetles, *Epilachna vigintiopunctata* Fabr. and *Epilachna dodecastigma* Mul., in Cochin. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 182, (1938).

SYSTEMATIC ZOOLOGY.

215. ABDULĀLI, H.—Some birds observed in Kutch and Kathiwar. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 122, (1938).

The author observed some rare birds in Kutch and Kathiwar. Among these were: the teal, *Nettapus coromandelicus* in full plumage; the White-winged Black Tit, *Parus nuchalis*; two species of Jacanas; and the Crow Pheasant, *Centropus sinensis*.

M. L. R.

216. ABDUSSALAM, M.—On a new Nematode parasite of the Himalayan Flying Squirrel (*Pteromys inornatus* Geoffroy). *Proc. Ind. Acad. Sci.* (B), VII, pp. 323–326, (1938).

A new species of Nematode of the genus *Wellcomia* is described. The measurements of the different parts of the parasite are given and both the male and female are illustrated. The parasite was found in the caecum of a flying squirrel shot at Mukteswar (U.P.).

K. K. N.

217. ACHARYA, H. G.—Distribution of *Sternocera nitidicollis* C. & G. (Buprestidae). *Journ. Bombay Nat. Hist. Soc.*, XL p. 579, (1938).

The habitat of *Sternocera nitidicollis* C. & G. has been given here as North Gujarat (border of the Rann of Cutch), Anarapura, Madras and Trimulgherry (South India). As indicated by the author, this beetle shows a preference to the *bar* tree.

S. R.

218. AHMAD, T.—*Pareuderus torymoides* Ferr., an egg parasite of the Amaranthus borer *Lixus truncatulus*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 189–190, (1938).

219. AHMAD, T.—A Chalcid parasite of the linseed midge, *Dasyneura lini*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 190, (1938).

220. ALI, S.—An additional list of birds from Hyderabad State. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 497–499, (1938).

Some years ago an ornithological survey was made of the Hyderabad State and the results published in the same journal (concluded, *J.B.N.H.S.*, XXXVII, p. 454). The author made a supplementary collection in the area in 1937 and in the present paper some 22 birds, not recorded by the first survey, are listed.

M. L. R.

221. Ali, S. and Abdulali, H.—The birds of Bombay and Salsette. Part IV. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 148–173, (1938).

In this part, the authors deal with some 85 birds, starting with the Bayas and ending with Nightjars. Among the birds dealt with are Wagtails, Pipits, Larks, Sunbirds, Woodpeckers, Kingfishers, Barbets, Cuckoos, Paroquets, Rollers, Swifts and Hornbills.

M. L. R.

222. Ali, S. and Abdulali, H.—The birds of Bombay and Salsette. Part V. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 367–381, (1938).

This is the fifth of the series of articles by the authors on the birds of Bombay and Salsette. It deals with some 59 species, starting with the Indian Barn Owl and ending with the Little Button Quail.

M. L. R.

223. Amin, M.—Two new species of *Airtellina* (Cestoda) from ovines in the Punjab. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 158, 159, (1938).

224. Amin, M.—The occurrence of the Cestode, *Helictometra giardi* (Moniez, 1879), in Indian sheep. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 159, (1938).

225. Anon.—Migration of wild fowl. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 335, (1938).

The results of ringing experiments on the migration of the Shoveller, the Mallard and the Gadwall are given. The ringing was done in the Punjab and Sind; the birds were recovered in Russia.

M. L. R.

226. Anon.—A guide to the insects of *Dalbergia sissoo* for Forest Officers. *Ind. For. Rec.* (E), IV, pp. 1–42, (1938).

The guide provides the essential facts in the life-histories of insects attacking *Dalbergia sissoo* or shisham, together with reference to the departmental literature in which more detailed accounts, descriptions, illustrations, etc., are available. Instructions for control measures are given for each species that is considered to be capable of causing damage and needing control.

The fauna of shisham includes 10 species of defoliating caterpillars, 11 defoliating beetles, 4 grasshoppers and crickets, 4 shoot-borers, 2 trunk-borers, 13 sapsuckers, 13 powderpost beetles, 11 other sapwood borers and 4 pinhole borers. A synopsis and an alphabetical index are provided.

C. F. C. B.

227. Arora, G. L.—Entomostraca of the Dal Lake, Kashmir. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 162, (1938).

228. Ayyar, P. N. K.—The Amaranthus Stem Weevil of S. India (*Lixus brachyrrhinus* Boh.) and its parasites. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 185, 186, (1938).

229. Ayyar, T. V. R.—A proposed revision of the present taxonomy and nomenclature of the Indian honey-bees. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 175, (1938).

230. **Baer, J. G.**—On the anatomy and systematic status of *Cleistogamia holothuriana* Faust, 1924. *Rec. Ind. Mus.*, XL, pp. 159–168, (1938).

The author redescribes the anatomy of *Cleistogamia holothuriana* Faust, 1924, a parasitic Trematode from the intestine of a holothurian collected in the Andaman Sea and deposited in the Indian Museum, Calcutta. Minute examination of the internal anatomy revealed some important discrepancies in the account by Faust as regards the systematic status of *Cleistogamia.* The drawing by Faust being upside down, the organ considered by him as a hold-fast organ is proved here to be the pharynx leading into the intestine. The author has shown that the Trematode described by Faust is really a Rhabdocoelid Turbellarian. In an additional note at the end of the paper the author contradicts the statement of Khalil and Azim (1937) that the genus *Louftia* is a synonym of *Cleistogamia.*

M. N. D.

231. **Barnes, A. M.**—Birds observed in and near Tambaram, Chingleput District, South India. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 467–476, (1938).

The author lists 80 birds which she observed near Tambaram.

M. L. R.

232. **Bates, R. S. P.**—Rose-finches and other birds of the Wardwan Valley. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 183–190, (1938).

The author describes some of the common birds of the Wardwan (or Warjwan) Valley (about 8,500 ft.) in Kashmir. Five excellent photographs of the Himalayan Turtle Dove, the Kashmir Sooty Flycatcher, Hodgson's Rose-Finch and Witherby's Paddy-field Warbler illustrate the paper.

M. L. R.

233. **Betts, F. N.**—Some birds of a Coorg Down. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 39–48, (1938).

The author describes the bionomics of the commoner birds of a down in Coorg, South India.

M. L. R.

234. **Betts, F. N.**—The birds of the Laccadive Islands. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 383–387, (1938).

The author gives a list of 44 species of birds that he obtained during a short visit to the Laccadives. Most of them are water birds.

M. L. R.

235. **Bhalerao, G. D.**—On a new trematode, *Travassostomum natritis* n.g., n.sp., from the intestine of the Indian river-snake, *Natrix piscator*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 158, (1938).

236. **Bhatia, B. L.**—Indian Sporozoa. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 156, (1938).

237. **Bhatia, B. L.**—Phylogeny and classification of the Sporozoa. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 156, (1938).

238. **Bhatia, B. L.** and **Setna, S. B.**—On some Gregarine parasites from certain Polychaete worms from the Andaman Islands. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 231–242, (1938).

The authors describe some interesting Gregarine parasites from the Polychaetes *Lysidice collaris* Grube, *Eunice siciliensis* and *Amphinome rostrata* (Pallas). One new genus and five new species have been established. The genus *Stomatophora* uptil now was recorded as a parasite of earthworms, but the new species *S. primitiva* is the first to be recorded from a Polychaete host. The new genus *Denteromera*, with *D. cleava* as genotype, is recorded from the intestine of *Eunice siciliensis*. Four other new species are *Lecudina eunicae*, *L. lysidicae*, *Ulivina eunicae* and *Selenidium amphinomi*.

M. N. D.

239. **BHATIA, M. L.**—On some larval stages of two species of Ichneumonidae, *Bassus tetragonus* Thumb. and *Homocidus fissorius* Grav., parasitising *Sphaerophoria flavicauda* Zett. (Diptera, Syrphidae). *Parasitology*, XXX, pp. 502–510, (1938).

In this work the author reports upon *Bassus tetragonus* Thumb. and *Homocidus fissorius* Grav., whose larvae were found parasitizing the Syrphid *Sphaerophoria flavicauda* Zett. In the main the paper deals with the morphology of the different stages and the anatomy of *Bassus tetragonus* Thumb., but it also contains an account of the biology of the larva of this parasite and the description of a single larva of *Homocidus fissorius* Grav.

S. R.

240. **BHATIA, M. L.**—On some leeches from the Dal Lake, Kashmir. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 161, 162, (1938).

241. **BIDDULPH, C. H.**—The birds of Rameswaram Island. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 238–256, (1938).

The author gives a list of the birds observed by him in the Rameswaram Island during the two-year period, June, 1929 to May, 1931. Some 109 species are included in the list.

M. L. R.

242. **BOSE, B. B.**—On *Agrilus citri* Thery (Buprestidae), a pest of *Citrus acida* in Bihar. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 187, (1938).

243. **BURT, D. R. R.**—New avian cestodes of the family Dilepididae from *Collocalia unicolor unicolor* (Jerd.), the Indian Edible-nest Swiftlet, with description of *Pseudangularia thompsoni*, *P. triplacantha*, gen. et spp. nov. and *Notopentorchis collocaliae*, gen. et sp. nov. *Spol. Zeyl.*, XXI, pp. 1–14, (1938).

The author records three new cestodes, *Pseudangularia thompsoni*, *P. triplacantha* and *Notopentorchis collocaliae* from the Indian Edible-nest Swiftlet, *Collocalia unicolor unicolor* (Jerd.) from Ceylon.

M. N. D.

244. **BURT, D. R. R.**—A new avian cestode, *Pseudochoaustaenia collocaliae*, gen. et sp. nov. (Dipylidiinae) from *Collocalia unicolor unicolor*. *Spol. Zeyl.*, XXI, pp. 15–20, (1938).

The author adds a further record of a new genus of cestode, *Pseudochoaustaenia collocaliae*, from the Indian Edible-nest Swiftlet.

M. N. D.

245. **BURT, D. R. R.**—New avian cestodes of the sub-family Dilepidiinae from the Eastern Swallow. *Spol. Zeyl.*, XXI, pp. 21–30, (1938).

The author records two new cestodes, *Vitta magniuncinata* and *V. minutiuncinata*, both from the Eastern Swallow, *Hirundo rustica gutturalis*.

M. N. D.

246. CAIUS, J. F.—The distribution of *Butheolus melanurus* Kessler. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 579, (1938).

The author records this scorpion from Northern Baluchistan, Sewa (Waziristan), the Punjab, Jodhpur (Rajputana), Shevgaon and Ahmedabad (Bombay Presidency).

S. R.

247. CHAKRAVARTY, G. K.—On a nematode, *Pseudaspidodera jnanendrae* n.sp., from the Peafowl (*Pavo cristatus*). *Parasitology*, XXX, pp. 167–170, (1938). [Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 159, (1938).]

The author records a new species of the nematode, *Pseudaspidodera jnanendrae* from the gut of the Indian Peafowl *Pavo cristatus*. The new species is distinguished from *Ps. pavonis* Baylis and Dubney in the separation of the cephalic cordons; from *Ps. spinosa* Maplestone in the presence of spines along the cephalic cordons and from *Ps. voluptusa* Chandler in the presence of the longer left spicules.

M. N. D.

248. CHAKRAVARTY, M.—Studies on Myxosporidia from freshwater fishes of Bengal. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 156, (1938).

249. CHATTERJI, R. C.—On a new genus of Amphistomes (Trematoda) from a Siluroid fish of Rangoon. *Rec. Ind. Mus.*, XL, pp. 337–340, (1938).

The author describes a new genus of amphistomes, *Maccallumia*, with *M. burmanica* as genotype, from the Siluroid fish, *Pangasius pangasius*, from Rangoon.

M. N. D.

250. CHERIAN, M. C. and ANANTANARAYANAN, K. P.—Studies on the coconut beetle (*Cryctes rhinoceros* Linn.) in S. India. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 187, (1938).

251. CHERIAN, M. C. and BASHEER, M.—A new Cecidomyiid pest of Moringa. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 185, (1938).

252. CHERIAN, M. C. and ISRAEL, M.—*Rhaconotus scirpophaga*, a parasite of the sugarcane white moth borer (*Scirpophaga*). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 190, 191, (1938).

253. CHERIAN, M. C. and KYLASAM, M. S.—Studies on *Laphygma exigua* Hb., and its natural enemies. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 184, (1938).

254. CHERIAN, M. C. and PILLAE, B. R.—*Semiothisa* (*Macaria*) *pervolgata*, a Geometrid pest of *Daincha* (*Sesbania aculeata*). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 184, (1938).

255. CHERIAN, M. C. and RAMACHANDRAN, S.—Notes on a braconid parasite of the wax moth (*Galleria mellonella*). *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 190, (1938).

256. **Clough, R. J.**—Sheldrake (*Tadorna tadorna* Linn.) in Orissa. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 334, (1938).

The author reports the occurrence of hundreds of this Sheldrake from the Chilka Lake, Orissa, on December 17, 1937. This record extends its hitherto known range in India.

M. L. R.

257. **Clough, R. J.**—Occurrence of the Sheldrake (*Tadorna tadorna*) in Murshidabad District, Bengal. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 129, (1938).

258. **Cobb, E. H.**—An extension of the range of the Western Horned Pheasant *Tragopan melanocephalus* (Gray). *Journ. Bombay Nat. Hist. Soc.*, XL, p. 569, (1938).

The author reports the finding of the Western Horned Pheasant from the Duber Valley of the Indus Kohistan (right bank), North-West Frontier Province, in the spring of 1938. This record extends the previously known range of the bird.

M. L. R.

259. **Croix, O. H. De St.**—Breeding of Pintail Snipe (?) in Belgaum District. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 570, 571, (1938).

The author reports the finding of nests of the Pintail Snipe (identity is not certain as the birds were not shot) in the Belgaum District, South India.

M. L. R.

260. **D'Abreu, E. A.**—The occurrence of the Turnstone, the Red-necked Phalarope, the Falcated Teal and the Sheldrake at Patna. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 332, (1938).

261. **Das, S. M.**—On a new ascidian from Bombay, *Ecteinascidia bombayensis* n.sp. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 164, (1938).

262. **Das, S. M.**—On *Ecteinascidia bombayensis*, n.sp. (A new Ascidian from Bombay.) *Proc. Ind. Acad. Sci.* (B), VIII, pp. 295–300, (1938).

263. **Das Gupta, B. M. and Chatterjee, H.**—Observations on a *Bodo*-like flagellate persistently occurring in the faeces of a human being. *Parasitology*, XXX, pp. 56–64, (1938).

The author records the result of his observations on the intestinal Protozoa of patients admitted to the Carmichael Hospital of Tropical Diseases, Calcutta. During the course of his study by means of culture media he came across a *Bodo*-like flagellate in the stool of a patient; this flagellate occurred persistently, as was shown by an examination of stool on different days.

M. N. D.

264. **Das Gupta, M.**—On a new Coccidium *Eimeria koormae*, n.sp. from the intestine of Indian tortoise, *Lissemys punctata* Smith. *Archiv. f. Protistenkunde*, XC, pp. 410–413, (1938). [Also *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 155, (1938).]

The author describes a new Coccidian, *E. koormae*, from the gut contents of the tortoise, *Lissemys punctata* Smith, from Jessore, Bengal. A comparative table is given at the end of the paper.

M. N. D.

265. **Das Gupta, M.**—On a new Coccidium *Isospora minuta*, n.sp. from the intestine of the cobra *Naja naja* Linn. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 236, 237, (1938).

The author describes a new species of Coccidium *Isospora minuta* from the small intestine of *Naja naja* Linn. captured by dealers from the Sunderbans in Bengal.

M. N. D.

266. **Dayal, J.**—A new trematode, *Phyllochorus macronius*, n.gen., n.sp., belonging to the family Gorgoderidae Looss (1901), from the body-cavity of a freshwater fish, *Macrones tengara*. *Proc. Ind. Acad. Sci.* (B), VII, pp. 138–142, (1938).

The author describes a new trematode parasite belonging to the family Gorgoderidae. It differs from other genera in having a receptaculum seminis and also differs in the relative position, shape of testes, ovary, etc.

K. K. N.

267. **Dayal, J.**—Studies on the trematode parasites of fishes. A new trematode *Neoganada barabankiae* (nov. gen., nov. spec.) from *Clarias batrachus*. *Proc. Ind. Acad. Sci.* (B), VII, pp. 132–137, (1938). [Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 157–158, (1938).]

A trematode belonging to a new genus and new species is described. It was found in the intestine of *Clarias batrachus*. The parasite belongs to the family Plagiorchiidae.

K. K. N.

268. **De Mello, I. F.** and **Da Fonseca, L.**—On the schizogonic forms of a plasmodid found in the blood of the green snake *Passerita mycterizans* Daud. *Proc. Ind. Acad. Sci.* (B), VII, pp. 47, 48, (1938).

A new species of the plasmodid parasite from the green snake *Passerita mycterizans* Daud is described. The morphology of the parasite is described and illustrated. The chromatin dividing into two, three and four granules, and the 'crucial multiplication' are some of the features observed.

K. K. N.

269. **De Mello, I. F.**, **Narana, G.** and **Datta, L.**—On a flagellate of the intestine of *Tatera indica* Hardwicke. *Proc. Ind. Acad. Sci.* (B), VII, pp. 177–181, (1938).

A new species of a flagellate, belonging to a new genus, from the intestine of a field rat of Nova Goa is described. The morphology and life-cycle of the parasite are also dealt with.

K. K. N.

270. **De Meyrelles, C. C.**—Parasites of the genus *Bertarellia* in the blood of the tortoises of India and Brazil. *Proc. Ind. Acad. Sci.* (B), VII, pp. 49–53, (1938).

The parasite belonging to the genus *Bertarellia* from the Indian tortoise *Emyda granosa* shows a clear halo around its chromatic part, while the protoplasm never shows the blue coloration which is characteristic of *B. calotis*. After a careful comparative study the author is convinced that there is no difference between the *Bertarellia* of the Indian and Brazilian tortoises. The forms of *Tunetella* are differentiated from *Bertarellia* by the darker stain of their nucleus and the separate existence of the bud of the division from the mother nucleus.

K. K. N.

271. **Dev, H.**—*Lithocolletis virgulata* Meyr. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 182, (1938).

272. **Eates, K. R.**—The status of the Koel (*Eudynamis scolopaceus* L.) in Sind. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 328, (1938).

In *Journ. Bombay Nat. Hist. Soc.*, XXXIX, No. 2, (1937), the author had reported the trend of the northward migration of the Koel from Karachi in Sind. In the present note the author gives records of the occurrence of the Koel still further north, *viz.*, from Shikarpur.

M. L. R.

273. **Eates, K. R.**—Occurrence of the Lesser Orange-breasted Green Pigeon (*Dendrophasa bicincta*) at Kaemari, Sind. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 330, 331, (1938).

The author records the finding of a specimen of the Lesser Orange-breasted Green Pigeon in Keamari (Karachi, Sind). The find is considerably outside the known range of this bird and the author thinks that the 'bird may have been driven southwards by the prevalent cold wave'.

M. L. R.

274. **Editor**—The nesting of the Malabar Head-spotted Woodpecker *Hemicircus canente cordatus* Jerdon. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 119, 120, (1938).

The editor reproduces a letter to him by C. Primrose on the nesting of this woodpecker in Malabar. Primrose found two eggs of this bird about whose nidification very little is known.

M. L. R.

275. **Fox, E. A.S.**—The Yellow-bellied Flycatcher (*Chelidorynx hypoxanthum*): an extension of its range. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 327, 328, (1938).

The author records this bird from the Sialkot District, Punjab. This is an extension of its range which was previously known to extend west up to the Simla Hills only.

M. L. R.

276. **Ganapati, P. N.**—On a new Myxosporidian, *Henneguya otolithus*, n.sp., a tissue parasite from the bulbus arteriosus of a massive fish, *Otolithus*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 155, 156, (1938).

277. **Gardner, J. C. M.**—Immature stages of Indian Coleoptera. (23). Carabidae. *Ind. For. Rec.* (E), III, pp. 149–157, (1938).

Larvae of the following species are described and figured: *Omophron smaragdus* And., *Harpalus indicola* Bates, *Ophonus indicus* Bates, *Tachys umbrosus* Notch., *Chlaenius punctatostriatus* Chaud., *Chlaenius circumdatus* Brull., *Tegragonoderus elegans* Andr.

AUTHOR.

278. **Gardner, J. C. M.**—Immature stages of Indian Lepidoptera. (1). Lymantriidae. *Ind. For. Rec.* (E), III, pp. 187–212, (1938).

Larvae of several species belonging to the genera *Lymantria*, *Desychira*, *Orgyia*, *Laelia*, *Bedoa*, *Etilpnetia*, *Caviria*, *Perina* and *Euproctis* are described, with keys. AUTHOR.

279. **Gardner, J. C. M.**—Immature stages of Indian Coleoptera. (24). Curculionidae (contd.). *Ind. For. Rec.* (E), III, pp. 227–261, (1938).

The larvae of thirty-six species of Indian Curculionidae are described and figured and the larval characters of several subfamilies are discussed.

AUTHOR.

280. **Gates, G. E.**—Indian earthworms. III. The genus *Eutyphoeus*. *Rec. Ind. Mus.*, XL, pp. 39–119, (1938).

In revising the genus *Eutyphoeus* in his series of papers on Indian earthworms, the author has created two new species, *E. callosus* and *E. festivus*, from specimens in the collections of the Indian Museum, Calcutta.

M. N. D.

281. **Gates, G. E.**—Indian earthworms. IV. The genus *Lampito* Kinberg. V. *Nellogaster*, gen. nov., with a note on Indian species of *Woodwardiella*. *Rec. Ind. Mus.*, XL, pp. 403–429, (1938).

In the revision of the systematics of the Indian earthworms the author has described a new species, *Lampito kempi*. A new genus, *Nellogaster*, with *N. bahli* as the type, has also been created to replace Stephenson's *Woodwardiella bahli*. A short note on Indian species of *Woodwardiella* is given.

M. N. D.

282. **Glover, J. W.**—A hybrid: Common Teal and Baikal Teal. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 334, (1938).

The author reports having shot an unusual teal in Kashmir which, he considers, might probably be a hybrid between the Common Teal (*Nettion creca*) and the Baikal Teal (*N. formosum*).

M. L. R.

283. **Günther, K.**—Neue und wenig bekante Phasmoiden aus dem Indian Museum, Calcutta. *Rec. Ind. Mus.*, XL, pp. 123–141, (1938).

The author records eighteen species of Phasmoid Orthoptera from British India, the Malay Archipelago, New Guinea, South America and the Philippines, of which nine are new to science. These are *Ignacia lobatipes*, n.sp. from Ecuador, *Korinnes errans*, n.sp. from North-East Assam, *Menexenus tenmalainus*, n.sp. from South India, *Ascelis glaber*, n.sp. from Burma, the Malay Peninsula and New Guinea, *A. annandalei*, n.sp. from Travancore, *Sipyloidex ? nitida*, n.sp. from Assam, *S. ? acanthonotus*, n.sp. from Sulu Is., *Sosibia ocellata*, n.sp. from Sinkep Is., and *Orthonecroscia errans*, n.sp. from Borneo, Java and California.

S. R.

284. **Hafiz, H. A.**—On two Chalcidoid parasites of Lepidoptera with a description of *Eupelmus terminaliae*, sp. nov. *Rec. Ind. Mus.*, XL, pp. 121–122, (1938). [Also in *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 175, (1938).]

The author records *Brachymeria euplocae* (Westw.) for the first time as a parasite of the Lycaenid butterfly *Virachola isocrates* F. and describes *Eupelmus terminaliae* sp. nov., found parasitising the eggs of a Lasiocampid moth.

S. R.

285. **Hafiz, H. A. and Mathai, G.**—On a collection of aquatic Rhynchota from the Rajmahal Hills, Santal Parganas, Bihar. *Rec. Ind. Mus.*, XL, pp. 207–210, (1938).

The authors list thirteen species of adult aquatic Rhynchota from the Rajmahal Hills, Santal Parganas, Bihar. They describe and figure the nymph of a Naucorid *Heleocoris vicinus* Montand.

S. R.

286. **Hewitt, W. A.**—Occurrence of the Black-Capped Kingfisher [*Halcyon pileata* (Bodd.)] in the Gonda District, U.P. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 128, (1938).

287. **Hora, S. L.**—Notes on fishes of the Indian Museum. XXXVI. On a collection of fish from the Rajmahal Hills, Santal Parganas (Bihar). *Rec. Ind. Mus.*, XL, pp. 169–181, (1938).

The author refers to the great value of the study of the fish-fauna of the Rajmahal Hills from a zoo-geographical point of view and gives a brief account of the physical conditions of the area investigated by a party of the Zoological Survey of India. A list of 34 species of fishes represented in the collection is given; of these 18 were exclusively collected from the hills. Of these 18 species, 12 are widely distributed in Indian waters, 3 are with restricted distribution in North India and Orissa, while 3 species are recorded from the west of the Ganges for the first time. Of the last three, the extension of the range of distribution of *Amblyceps mangois* (Ham.) and *Laguivia ribieroi* (Hora) is of particular interest. The author concludes that a study of the fish-fauna of the Rajmahal Hills has clearly shown its continuity with the fauna of the hills of Assam. Notes are given on all the species represented in the collection.

S. L. H.

288. **Hora, S. L.**—Notes on fishes in the Indian Museum. XXXVII. On a collection of fish from the Bailadila Range, Bastar State, Central Provinces. *Rec. Ind. Mus.*, XL, pp. 237–241, (1938).

The author records 13 species of fishes from the Bailadila Range, Bastar State, Central Provinces. Of these 5 are noted to be widely distributed in India while the remaining are generally found in Peninsular India. Special mention is made of the occurrence of *Parapsilorhynchus tentaculatus* (Annandale), *Glyptothorax dekkanensis* (Gunther), *Barbus pinnauratus* (Day), *Barbus amphibius* (C. & V.), *Garra mullya* (Sykes), *Nemachilus aureus* (Day), *N. evezardi* (Day), and *N. dayi* (Hora) in the Bastar State, and short notes are given on these and some other species. The author concludes that the distribution of the species enumerated above indicates that the Satpuras once served as the route of migration of the freshwater fauna from Assam to the Western Ghats.

S. L. H.

289. **Hora, S. L.**—A new name for *Silurus sinensis* Hora. *Rec. Ind. Mus.*, XL, p. 243, (1938).

The author renames his *Silurus sinensis* from Kwangsi, China (*nec S. sinensis* Lacépède) as *Silurus gilberti.*

S. L. H.

290. **Hora, S. L.**—Notes on fishes in the Indian Museum. XXXVIII. On the systematic position of *Bagrus lonah* Sykes, with descriptions of and remarks on other Glyptosternoid fishes from the Deccan. *Rec. Ind. Mus.*, XL, pp. 363–375, (1938).

The systematic position of *Bagrus lonah* (Sykes) is discussed in detail and its precise specific limits in the genus *Glyptothorax* (Blyth) elucidated. It is further shown that 5 species of *Glyptothorax, viz., G. lonah* (Sykes), *G. madraspatanus* (Day), *G. annandalei* (Hora), *G. conirostre* (Steind.) var. *poonaensis* nov. and *G. trewavasae*, sp. nov., can be recognised from Peninsular India. A key to these species is given and the new variety and species are described in detail. Notes are also given on other species.

S. L. H.

291. **Hora, S. L.**—The game fishes of India Part IV. The Silond Catfish, *Silonia silondia* (Ham.). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 137–147, (1938).

In this article the author deals with the nomenclature and systematic position of *Silonia silondia* (Ham.) and gives a complete description of the species. A table of measurements and a note on the bionomics and fishing methods of *Silonia* are also given.

S. L. H.

292. **HORA, S. L.**—The game fishes of India. Part V. The Pungas Catfish *Pangasius pangasius* (Ham.). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 355–366, (1938).

In this article the author deals with the nomenclature and systematic position of *Pangasius pangasius* (Ham.) and gives a complete description of the species. Special attention is directed to the variation in the form of dentition and air-bladder in specimens of different sizes. A probable variety of the species in the Bhavani River is briefly referred to. A table of measurements and notes on the bionomics and fishing methods are also given.

S. L. H.

293. **HORA, S. L. and MISRA, K. S.**—Fishes of Deolali. Part III. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 20–38, (1938).

In this third and final part of the series of articles on the fishes of Deolali, the authors give a complete list of the fish-fauna comprising 50 species and 13 families—29 species belong to the family Cyprinidae, 4 to Cobitidae, 3 to Ophicephalidae, 3 to Ambassidae, 2 to Siluridae, 2 to Sisoridae and 1 each to Notopteridae, Mastacembelidae, Anguillidae, Heteropneustidae, Bagridae, Schilbeidae and Gobiidae. The local names of the various species and their distribution in Deolali waters are also given in the list. One new species of *Barbus* and another of *Parapsilorhynchus* are described, while notes on *Chela clupeoides* (Bloch), *Barbus khudree* Sykes, *Barbus kolus* Sykes, *Barbus ticto* (Ham.), *Crossochilus latius* (Ham.), *Lepidocephalichthys guntea* (Ham.), *Nemachilus botius* (Ham.), *Nemachilus denisonii* Day and *Ambassis baculis* (Ham.) are given in the systematic part of the paper. The consideration of the zoo-geography of the fauna is postponed till other collections from Peninsular India are worked out.

S. L. H.

294. **HORA, S. L. and MUKERJI D. D.**—Table for the identification of Indian freshwater fishes, with discriptions of certain families and observations on the relative utility of the probable larvivorous fishes of India. *Health Bull.*, No. 12, *Malaria Bur.* No. 4, pp. 1–47, (Delhi, 1938).

In the table of identification of freshwater fishes the authors have included all the Indian families, including the catadromous and anadromous forms. Besides, two exotic families—the Salmonidae and the Poeciliidae—which have become acclimatised to Indian conditions are also included. In drawing up the table, the authors have attempted to use, as far as possible, only external, easily recognisable characters for differentiating the great variety of Indian freshwater fishes. The unavoidable technical terms used are explained with suitable illustrations.

In the appendices that follow the table a description of the Indian families of the probable larvivorous fishes and their relative utility in the control of mosquitoes is given. A note is also appended on the collection, preservation and transport of small fishes.

S. L. H.

295. **HUGHES, J.**—Birds in an Assamese garden. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 7–9, (1938).

The author gives a list of some 41 birds which he found in his garden in Assam. Of those seven nested in the garden.

M. L. R.

296. **HUSAIN, M. A. and LAL, K. B.**—The cotton jassid, *Empoasca devastans* Distant. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 183, (1938).

297. **INGLIS, C. M.**—The Kingfishers of our area. Part VII. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 81–86, (1938).

This is the last of the series of articles by the author on the Kingfishers of the Bengal Duars. It deals with the systematics and bionomics of the Indian Ruddy Kingfisher, *Entomothera coromanda coromanda* (Latham).

M. L. R.

298. **Inglis, C. M.**—The Indian Black-headed Oriole. *Journ. Darjeeling Nat. Hist. Soc.*, XII, p. 116, (1938).

The Indian Black-headed Oriole is recorded as occurring at an elevation of 3,500 ft. in a tea garden in the Bengal Duars, this being the first record of the bird at such an elevation.

M. L. R.

299. **Inglis, C. M.**—The sunbirds and spider-hunters of our area. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 1–6 (1938).

This is a continuation of the series of articles by the author on the sunbirds and spider-hunters of the Bengal Duars. The present paper deals with the Indian Streaked Spider-hunter, *Arachnothera magna magna* (Hodgs.).

M. L. R.

300. **Inglis, C. M.**—The broadbills of the Darjeeling District and the Duars. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 47–53, (1938).

This is the first of a series of articles by the author on the broadbills of the Bengal Duars in which area only two species occur. The present note deals with the systematics, habits and nidification of the Nepal Collared Broadbill (or Hodgson's Broadbill), *Serilophus rubropygius* (Hodgson).

M. L. R.

301. **Janjua, N. A.**—*Lucilia sericata* Meigen. in Baluchistan. *Current Science*, VI, p. 456, (1938).

The author records, for the first time, the sheep maggot fly, *Lucilia sericata*, from Baluchistan.

M. L. R.

302. **Jones, A. E.**—A note on the Lycaenid butterfly *Everes dipora* (Moore). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 133, 134, (1938).

In this note the author has recorded and illustrated the egg, larva and pupa of the Lycaenid butterfly *Everes dipora* (Moore) which is commonly found in the warmer months at altitudes of from 3,000 ft. to 6,000 ft. in the Simla Hills. The larvae alone are found to be dimorphic. The food plants of the butterfly are *Desmodium parvifolium* and *Flemingia fruticulosa*.

S. R.

303. **Jones, A. E.**—Nesting of the Booted Eagle, *Hieraetus pennatus* (Gmelin), in the Simla Hills. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 568, (1938).

The author reports the finding of a nest of the Booted Eagle in the Simla Hills on May 10, 1938, at an elevation of 6,000 ft. Authentic records of this bird's breeding in India are very few.

M. L. R.

304. **Kumar, A.**—Some freshwater sponges from the Dal Lake, Kashmir. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 156, (1938).

305. **Lal, K. B.**—The first record of the Eulophid genus *Azotus* from India (Chalcidoidea: Hymenoptera). *Rec. Ind. Mus.*, XL, pp. 1–4, (1938).

The author describes and figures the new species *Azotus delhiensis* from Buldi-Karnal, Delhi Province. The species was reared by the author from nymphs of the whitefly, *Aleurolobus barodensis* Mask., found infesting sugarcane. This is the first record of the genus from India. The genus *Azotus* had previously been known from China, Africa, Southern Europe, Australia, N. America, Java and Japan. A note on its economic status is appended.

S. R.

306. Lall, S.—On some tunicates from Karachi. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 164, (1938).

307. Lewis, E. S.—Bewick's Swan (*Cygnus bewickii* Yarrel) near Delhi. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 333, (1938).

This is the third known record of this rare swan within Indian limits.

M. L. R.

308. Livesey, T. R.—The nidification of Burmese Barred-back Pheasant (*Syrmaticus humiae burmanicus*). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 568, 569, (1938).

The author describes, for the first time from India, the nidification of the Burmese Barred-back Pheasant. The full clutch consisted of seven eggs obtained on April 6 near Taunggyi, Burma.

M. L. R.

309. Livesey, T. R.—The Shan Brown Wood Owl (*Strix indranee* Baker). *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 567, 568, (1938).

The author describes eggs which probably belong to the Shan Brown Wood Owl. The owl itself was first obtained by the author in 1933 in Burma and was described by Stuart Baker in 1935. Nothing is known of its nidification.

M. L. R.

310. Low, G. C.—The supposed races of the Grey or Black-bellied Plover (*Squatarola squatarola*). *Ibis*, II (14th Ser.), pp. 154–156, (1938).

The author gives the measurements of this Plover from Great Britain, America, the Indian Region, the Far East and Russia. In the Indian Region the birds are from Calcutta, Colombo, Karachi, Madras and the Persian Gulf. The author concludes that there is no justification for the splitting up of the species into races as has been done by some writers.

M. L. R.

311. Lowther, E. H. N.—Notes on some Indian Birds. III. Birds in my garden. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 409–424, (1938).

The author gives his observations on the natural history of some common birds in Eastern India. The birds dealt with are: sunbirds, wood-shrikes, nuthatches, mynahs, barbets, woodpeckers, kites, doves, crows, crow-pheasants, bulbuls, warblers, magpie-robins, and a few others.

M. L. R.

312. Ma Tsing-chao—The Indian species of the genus *Xylocopa* Latr. (Hymenoptera). *Rec. Ind. Mus.*, XL, pp. 265-329, (1938).

In this work the author has revised the Indian species of the genus *Xylocopa* and given keys for the separation of its subgenera and species. A table showing the main points of sexual dimorphism met with in members of the genus is included. The following new subgenera and species are recorded and described: *Xylocopa* (*Nyctomelitta*) *proximata*, sp. nov., from the Andamans, *X.* (*Biluna*) *pictifrons concolorata*, subgen. *et* subsp. nov., from Sikkim, *X.* (*Ctenopoda*), subgen. nov., *X.* (*Nodula*) *punctigena*, subgen. *et* sp. nov., from the Punjab and the United Provinces, *X.* (*N.*) *prashadi*, sp. nov., from Madras, *X.* (*N.*) *remota*, sp. nov., from ? South India, *X.* (*Zonohirsuta*) *collaris bhowara*, subgen. *et* sp. nov. from South India, and *X.* (*Orbitella*) *hafizii*, subgen. *et* sp. nov., from Travancore. *X. amethystina* Cockerell has been re-named *X.* (*N.*) *ramakrishnai* by the author.

S. R.

313. McCann, C.—The Reptiles and Amphibia of Cutch State. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 425–427, (1938).

The author gives a list of the Reptiles and Amphibia of Cutch State. Twenty-eight Reptilia and three Amphibia are listed. the latter including *Rana cyanophlyctis*, *Rana tigrina* and *Bufo andersoni*.

M. L. R.

314. Mahadevan, G. (Miss)—Preliminary observations on the structure of the uterus and the placenta in *Scoliodon sorrakowah*. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 165, (1938).

315. Mahendra, B. C.—The taxonomic description of *Rhinophis travancoricus* Boul. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 388–390, (1938).

The author gives a revised taxonomic description of this rare snake found in Travancore alone.

M L. R.

316. Marshall, Sir G. A. K.—New Indian Curculionidae (Col.). *Ind. For. Rec.* (E), III, pp. 159–184, (1938).

The following new genera and new species are described:—*Xanthochelus blumeae* sp. n. (United Provinces: Dehra Dun); *Pachytychius viciae* sp. n. (United Provinces: Dehra Dun); *Drepanoscelus* gen. n. with genotype *D. gardneri* sp. n. (United Provinces: Mussoorie); *Thamnobius fasciatus* sp. n.[1] (Bengal: Kurseong; Malay Peninsula: Singapore); *Balaninus fulvus* sp. n. (United Provinces: Dehra Dun); *Balaninus punctum* sp. n. (United Provinces: Dehra Dun); *Balaninus roridus* sp. n. (United Provinces: Dehra Dun); *Apion nalderae* sp. n. (Simla Hills: Naldera); *Rhadinomerus rugirostris* sp. n. (United Provinces: Dehra Dun); *Rhadinomerus lensis* sp. n. (United Provinces: Dehra Dun); *Cryptorrhynchus corni* sp. n. (United Provinces: Garhwal); *Lobotrachelus laporteae* sp. n. (Bengal: Kalimpong, Buxa Dooars, Lebong; Assam: Khasi Hills); *Chelothippia* gen. n. with genotype *C. buteae* sp. n. (United Provinces: Dehra Dun); *Podeschrus fuscosuturalis* sp. n. (United Provinces: Dehra Dun); *Dinobaris* gen. n. with genotype *D. longirostris* sp. n. (Bengal: Kalimpong); *Baris achyranthis* sp. n. (United Provinces: Dehra Dun); *Baris celosiae* sp. n. (United Provinces: Dehra Dun); *Acythopeus bispinosus* sp. n. (United Provinces: Dehra Dun); *Cossonus albizziae* sp. n. (United Provinces: Dehra Dun); *Macrorrhyncolus ventilaginis* sp. n. (United Provinces: Dehra Dun); *Phloeophagosoma subcaecum* sp. n. (United Provinces: Almora); *Exodema ilicis* sp. n. (United Provinces: Almora); and *Coptus anamalainus* sp. n. (S. India: Anamalai Hills).

J. C. M. G.

317. Mayr, E.—The birds of the Vernay-Hopwood Chindwin Expedition. *Ibis*, II (14th Ser.), pp. 277-320, (1938).

The author gives a list, with systematic comments, of 222 species of birds collected by the Vernay-Hopwood Expedition in the Chindwin District, Upper Burma. The Expedition was arranged by the American Museum of Natural History and was in Chindwin from January to April, 1935.

M. L. R.

318. Mehra, H. R.—Two new species of blood-flukes belonging to the family Spirorchidae Std. (Trematode) with comments on the identity of the genera *Plasmiorchia* Mehra, 1934, and *Gomtiotrema* Sinha, 1934, and classification of the family. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 157, (1938).

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[1] *Thamnobius fasciatus* was previously described as *Hexeria concinna* Pascoe., see p. 163.

319. **Meinertzhagen, R.**—On the birds of Northern Afghanistan. *Ibis*, II (14th Ser.), pp. 480–520, (1938).

This is the first part of a series of papers on Afghanistan birds collected by the author in 1937. This part covers a portion of the Passeres, beginning with crows and ending with wagtails and pipits. Brief field-notes are added to each species.

M. L. R.

320. **Menon, M. A. Unnikrishna.**—A trematode parasitic to Anopheles mosquitoes. *Journ. Malaria Inst. India*, I, pp. 391–394, (1938).

An encysted trematode found parasitic in two out of fifty-two specimens of *Anopheles culicifacies* Giles, collected from Bhuthapandy, South Travancore, is described. The parasite closely resembles *Agamodistomum sintoni* Van Thiel. The differences are mainly in respect of the dimensions of the cysts and the nature of the cyst wall.

M. A. U. M.

321. **Menon, R. D.**—Two new species of Pachytroctidae (Copeognatha) with a note on the family. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 280–287, (1938).

The author describes and figures the apterous and alate forms of two new Psocids, *Psacadium georgi*, sp. nov., and *Perithocles cochinensis*, sp. nov., both from Tripunithura (Cochin State). In view of his discovery of the alate specimens of *Psacadium*, he adds a note supporting Pearman's amalgamation of Englerlein's subfamilies Pachytroctinae and Tapinellinae of the family Pachytroctidae.

S. R.

322. **Misra, K. S.**—On a collection of fish from the Eastern Ghats. *Rec. Ind. Mus.*, XL, pp. 255–264, (1938).

The author deals with a collection of fish made in certain parts of the Eastern Ghats during June to August 1929. The fish were collected from the Shevaroy Hills, the Chitteri Range, the Javadi Hills, the Yelagiri Hills, the Den Kani Kota Range, the Seshachalam and Palkonda Hills, the Lankamaila Hills, and the Nallamalai Hills, and comprised 37 species belonging to 13 families. Short notes are given on the various species, but particular reference may be made to the account of sexual dimorphism in *Barbus melanampyx* Day. The chief interest of this paper lies in the fact that it adds materially to our knowledge of the geographical distribution of some of the common species of the Peninsula.

S. L. H.

323. **Misra, M. P., Gupta, S. N.** and **Singh, J. N.**—*Apanteles tachardiae* Cam., an endoparasite of the larva of *Holcocera pulverea*, Meyr., predaceous on lac. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 189, (1938).

324. **Moseley, M. E.**—The Indian caddis-flies (Trichoptera). Part V. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 486–496, (1938).

The present paper is a further contribution from the author on the systematics of the Indian caddis-flies. It deals with the family Sericostomatidae and includes the subfamilies Sericostomatinae, Goerinae and Brachycentrinae only. A key to the subfamilies is included. The following new species are described and figured:—*Notidobia nigra*, sp. nov., and *Goera atra*, sp. nov., both from N.E. Burma, *G. kursea*, sp. nov., from Kurseong, *G. kalimpa*, sp. nov., from Kalimpong, *G. minor*, sp. nov., from Burma, *G. mandana*, sp. nov., from the Andamans, *G. mishmia*, sp. nov., from Assam, *G. rumaba*, sp. nov., from N.E. Burma, *G. tridens*, sp. nov., from Kharsis, *Micrasema baitina*, sp. nov., from N.E. Burma and *M. punjaubi*, sp. nov., from the Punjab.

S. R.

325. MUDAHAI, S. V. and IYER, K. S. G.—*Pseudanoplacephala crawfordi* (Baylis). *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 235–238, (1938).

The authors describe an adult tapeworm, *Pseudanoplacephala crawfordi* (Baylis) from the pig. The adult form has not been described from India so far although it is a fairly common worm infesting the intestine of domestic pigs in South India.

M. N. D.

326. MUNNS, F. C. A.—On cuckoos in Sugaon, Champaran District, Bengal. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 576, 577, (1938).

The author records the eggs of the Indian Cuckoo from the Champaran District, Bihar. (In the title the author wrongly places this District in Bengal.) The finding of the nests of a number of other birds is also recorded.

M. L. R.

327. MUNRO, H. K.—Studies on Indian Trypetidae (Diptera). *Rec. Ind. Mus.*, XL, pp. 21–37, (1938).

In this paper the author records and remarks upon fifteen species of Trypetidae from India and describes and figures four species new to science. These are *Chelyophora gladiella*, sp. nov., from Pusa, *Vidalia trigenata*, sp. nov., from Naini Tal, *V. flectcheri*, sp. nov., from Kurseong and *Rhacochlaena cassiae*, sp. nov., from Pusa. The heads of the males of species of *Vidalia* showing the carinae bearing the inferior orbital bristles are illustrated in a text-figure. *Vidalia hendeli*, nom. nov. is proposed for *V. cervicornis* Brun.

S. R.

328. NARAYAN RAO, C. R.—Tadpoles of a genus not recorded from India. *Current Science*, VI, pp. 455, 456, (1938).

Some tadpoles from South India assigned by Annandale (1918) to the family Cystignathidae have been re-examined by the author. On the basis of skeletal and other characters, the author regards them as approximating to the Microhylid genus *Uperodon*. According to the author, the tadpoles might necessitate the creation of a new genus or even a new subfamily.

M. L. R.

329. NAZIR AHMAD—On the fishes of the Dal Lake, Kashmir. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 167, (1938).

330. NEGI, P. S. and GUPTA, S. N.—*Eupelmus tachardiae* How., and the lac insects. *Current Science*, VI, pp. 387–392, (1938).

To refute Mahadihassan's theory that *Eupelmus tachardiae* How. is an ectoparasite of *Eublemma amabilis*, the authors recount a series of facts, both observed and confirmed, and illustrated here, which again supports their view that *E. tachardiae* How., is an endoparasite of the lac insect and an ectoparasite of *Microbracon greeni* and other insects, a view held also by Glover.

S. R.

331. PANDE, B. P.—The trematode genus *Allocreadium* in the North Indian freshwater fishes. *Proc. Ind. Acad. Sci.* (B), VII, pp. 54–60, (1938).

Two new species of trematode parasites belonging to the genus *Allocreadium*, namely, *A. nicolli* and *A. kosia*, are described from two fishes, *Gobius guiris* and *Barbus chilinoides*. A historical review of the genus is also given.

K. K. N.

332. **Panikkar, N. K.**—Studies on the brackish water anemone *Pelocetes exul* Annandale, and on *Pelocetes minima*, a new marine species from Madras. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 157, (1938).

333. **Parsons, R. E.**—Arrival and stay of snipe in Assam. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 128, 129, (1938).

The author gives the earliest dates of the arrival and the duration of stay of the Pintail and Fantail Snipes in the various regions of Assam.
M. L. R.

334. **Podder, T. N.**—A new species of Acanthocephala, *Acanthosentis dattai* n.sp., from a freshwater fish of Bengal, *Barbus ticto* (Ham. & Buch.) and *Barbus stigma* (Cuv. & Val.). *Parasitology*, XXX, pp. 171–175, (1938).

The author describes a new species of Acanthocephala, *Acanthosentis dattai*, from the intestine of *Barbus ticto* and *Barbus stigma*. He also records his observations on the mode of copulation and the relative position of the genitalia of the sexes during copulation.
M. N. D.

335. **Prater, S. H.**—The Snipe-billed Godwit (*Limnodromus taczanowskius* (Verreaux) in Orissa. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 332, (1938).

The author records this rare winter immigrant at the Chilka Lake, Orissa, in December, 1937.
M. L. R.

336. **Primrose, J. B.**—Supplementary observations on the Munnar section of the Ornithological Survey of Travancore and Cochin. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 500–507, (1938).

The author lists some 73 birds which he observed at Munnar.
M. L. R.

337. **Rao, M. A. N.**—*Dipetalonema dracunculoides* (Cobbold, 1870). *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 127–130, (1938).

The author records *Dipetalonema dracunculoides* (Cobbold, 1870) for the first time from India. The worms were found in the peritoneal cavity of an indigenous dog of the Rajapalayam breed of South India.
M. N. D.

338. **Rao, M. A. N.**—*Poteriostomum ratzi* (Koltan, 1919). *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 131, 132, (1938).

The author gives a short note on *P. imparidentum* (Quiel) and *P. ratzi* (Kotlan). The latter, from the large intestine of a hackney pony in Madras, is recorded for the first time in India.
M. N. D.

339. **Rao, M. A. N.**—*Micipsella indica* n.sp. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 251–254, (1938).

The author describes a new species of a filariid worm, *Micipsella indica*, from the portal vein in the liver of the hare, *Lepus nigricollis*. A table is also given to show the differences between *M. numidica*, Seurat, 1917, and the new species. Due to the presence of the worm the liver showed passive congestion.
M. N. D.

340. Rao, M. A. N.—A note on *Plasmodium bubalis* Sheather. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 387–390, (1938).

The author records his discovery of a protozoon, *Plasmodium bubalis*, in the blood of two buffaloes at the Imperial Veterinary Research Institute at Muktesar. This parasite has not been reported from any other province in India except Madras. M. N. D.

341. Ray, H. N. and Das Gupta, M.—On a new coccidium *Eimeria stolatae*, n.sp. from the intestine of the Common Indian Grass Snake, *Natrix stolata* (Linn.). *Archiv. f. Protistenkd.*, XC, pp. 361–364, (1938).

The authors describe a new species of coccidium, *Eimeria stolatae*, from the gut of the common Indian Grass Snake, *Natrix stolata*, from Calcutta. M. N. D.

342. Reeve, M. B. P.—Occurrence of the Long-tailed Duck (*Clangula hyemalis* Linn.) near Quetta. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 333, 334, (1938).

The author shot one (Jan. 2, 1938) and observed six of these rare ducks in Khush Dil Khan Lake, 40 miles from Quetta. This is the fourth recorded instance of the occurrence of this duck within Indian limits since the publication of the record of a specimen shot in October 1933 in Baluchistan. M. L. R.

343. Ribeiro, S.—A new species of *Bhooria* Distant (Jassidae: Rhynchota). *Rec. Ind. Mus.*, XL, pp. 17–19, (1938).

The author describes and figures a new species of a Jassid, *Bhooria subrotundata*, sp. nov. The only specimen of the species, a male holotype, was taken in Gangtok, 6,000 ft., in Sikkim. S. R.

344. Roy, D. N.—A Note on the larva of *A. varuna* Iyengar. *Journ. Malaria Inst. Ind.*, I, pp. 269–272, (1938).

A critical examination of the larva of *A. varuna* Iyengar in Bengal shows that the antero-internal clypeal hairs are finely frayed and the ends of the thoracic palmate hairs are drawn out. In this respect it differs from the type described by Christophers and Puri. D. N. R.

345. Scott, F. B.—The early states and adult of *Brahmaea wallichii* Gray. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 30–34, (1938).

The author describes the life-history of the Brahmaeid moth, *Brahmaea wallichii* Gray from material obtained in Shillong. The species is confined to the Himalayas and Burma. The four larval stages and imago of this moth are figured in colours. The food plant of the species is *Ligustrum robustum* Blume. Reference is also made to the earlier account of this moth in the same journal. S. R.

346. Sen, P.—Early stages of *Aedes lophoventralis* (Theobald). *Rec. Ind. Mus.*, XL, pp. 359–361, (1938).

In this paper the author describes and figures, for the first time, the larva and pupa of *Aedes lophoventralis* (Theob.) from specimens found breeding in tree-holes at Madhyamgram (Bengal). S. R.

347. **Sen, P.**—On a new species of Acanthocephala, *Acanthosentis holospinus*, sp. nov., from the fish *Barbus stigma* (Cuv. & Val.). *Proc. Ind. Acad. Sci.* (B), VII, pp. 41–46, (1938).

A new species of Acanthocephala, *Acanthosentis holospinus* from the fish *Barbus stigma* is described in detail. Its diagnostic features as well as the morphology and anatomy are studied. The difference between this and the only other described species is discussed.

K. K. N.

348. **Sen, P.**—A check- and host-list of Ixodoidea (ticks) occurring in India. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 133–147, (1938).

The author gives here the Indian distribution and host-parasites of the ticks so far known to occur in India.

S. R.

349. **Sevastopulo, D. G.**—A supplementary list of the Pyralidae of Calcutta. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 132, 133, (1938).

350. **Sevastopulo, D. G.**—The Lepidoptera of Peshoke, December 1936. Supplementary note. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 90, 91, (1938).

The author gives here an additional list of the Lepidoptera of Peshoke and corrects the names of two species recorded earlier in the same journal.

S. R.

351. **Sevastopulo, D. G.**—A supplementary note on the Heterocerca of Darjeeling. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 91, 92, (1938).

The present note records the corrections and additions revealed by the re-examination of the collections of Heterocerca made in Darjeeling and recorded in *Journ. Darjeeling Nat. Hist. Soc.*, X & XI. The nomenclature and general terms are the same as those used in the original notes.

M. N. D.

352. **Shaw, G. E., Shebbeare, E. O.** and **Barker, P. E.**—The snakes of Northern Bengal and Sikkim. (New series.) *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 105–112, (1938).

This paper inaugurates a new series of articles on the snakes of North Bengal and Sikkim, the original series having appeared in 1928 in the same journal. The total number of snakes to be dealt with in the series will be 76, as compared to 74 in the original series, the two new snakes added being the Common Blind Snake *Typhlops brahminus* and the Painted Keelback *Xenochrophis cerasogaster*. In the present article the mode of using the key and the types of scaling are given.

M. L. R.

353. **Shaw, G. E., Shebbeare, E. O.** and **Barker, P. E.**—The snakes of Northern Bengal and Sikkim. (New series.) Part II. *Journ. Darjeeling Nat. Hist. Soc.*, XII, pp. 166, 167, (1938).

In this part the authors give a classification of the snakes of Northern Bengal and Sikkim, illustrated by one plate of the head-shields of snakes and six charts giving the classification. Five families, out of a total of nine in India, are represented in this region; they are: Typhlopidae, Boidae, Colubridae, Amblycephalidae and Viperidae.

M. L. R.

354. **Shaw, G. E., Shebbeare, E. O.** and **Barker, P. E.**—The snakes of Northern Bengal and Sikkim. Part III. *Journ. Darjeeling Nat. Hist. Soc.*, XIII, pp. 64–73, (1938).

This is the third part of the series and deals with (i) Fam. Typhlopidae (*Typhlops oligolepis* Wall.; *T. porrectus* Stolicz.; *T. jerdoni* Boulenger; *T. diardi* Schlegil; and *T. brahminus* Daudin), and (ii) Fam. Boidae (*Python molurus* Linn.). M. L. R.

355. **Silvestri, F.**—Description of a new myrmecophilous *Lepisma* (Thysanura) from India. *Rec. Ind. Mus.*, XL, pp. 143–145, (1938).

The author gives a description of *Lepisma subnigrina*, sp. nov., which he also figures. The species was taken in a nest of the ant *Cremastogaster* sp. in Coimbatore, South India. S. R.

356. **Singh, J. N., Negi, P. S., Misra, M. P.** and **Gupta, S. N.**—A trichogrammid chalcid parasite of the egg of *Eublemma amabilis* Moore, predaceous on lac. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 189, (1938).

357. **Singh, K.**—Notes on Aleurodidae (Rhynchota) from India. *Rec. Ind. Mus.*, XL, pp. 189–192, (1938).

The author describes and records *Aleurotuberculatus parvus*, sp. nov., from Rangoon (host: *Bombax malabaricum*), *A. burmanicus*, sp. nov., from Rangoon and Insein (host *Cassia* sp.) and *Aleuroputeus publicus*, sp. nov., from Nagpur (host: *Tephrosia purpurea*). Two plates, illustrating the new species, are given. S. R.

358. **Srivastava, H. D.**—A new trematode, *Prosthogonimus indicus* n.sp., occurring in the oviduct of Indian fowls with remarks on 'Prosthogonimiasis'. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 213–220, (1938).

The author records the presence of a new trematode, *Prosthogonimus indicus* from the oviduct of fowls. A study of the life-cycle and distribution of the parasite *Prosthogonimus* has been made. M. N. D.

359. **Srivastava, H. D.**—Studies on the helminth parasites of Indian poultry. Part. II. The occurrence of gapeworm in fowls. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 239–242, (1938).

The author gives a note on the occurrence of the gapeworm in Indian fowls. In the absence of satisfactory treatment, a few suggestions are given to dislodge the worms by mechanical means, with or without the aid of certain chemicals. M. N. D.

360. **Srivastava, H. D.**—A new parasite of the family Acanthocolpidae Luhe from an Indian host. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 247, 248, (1938).

The author records a new species of the trematode, *Echinostephanus cloacum* from the intestine of an edible fish found in the Bay of Bengal and the Arabian Sea. M. N. D.

361. SRIVASTAVA, H. D.—The occurrence of an unrecorded filariid nematode, *Onchocerca cervicalis* Railliet and Henry, 1910, in the *ligamentum nuchae* of horses in India. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 249, 250, (1938).

The author records, for the first time in India, the occurrence of a filariid nematode, *Onchocerca cervicalis* in the *ligamentum nuchae* of horses. No treatment for destruction of the worms is known but the author suggests some precautionary measures.

M. N. D.

362. SRIVASTAVA, H. D.—The occurrence of *Paragonimus westermani* in the lungs of cats in India. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 255–258, (1938).

A short note on the occurrence of the lung-fluke, *Paragonimus westermani*, in the cat is given. The lung-fluke of mammals has long been recognised as an important parasite of man and animals, both domestic and feral, and is of considerable veterinary importance.

M. N. D.

363. SRIVASTAVA, H. D.—Studies on the *gasterostomatus* parasites of Indian food fishes. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 317–340, (1938).

The author records the presence of several new gasterostomatous trematodes from Indian food fishes, both marine and freshwater. The following new species, *viz.*, *Bucephalus indicus* and *B. gangeticus* from *Macrones scenghala*; *B. barina* from *Scalophagus argus*; *B. belonea* from *Belona strongylura*; *Prosorhynchus manteri* from *Tetradon oblongus*, and *P. arabiana* from *Synaptura orientalis* have been described in detail.

Bucephalopsis garui Verma, as described by the author, differs from the type-species in the number of vitelline follicles and the anterior extent of vitellaria, in the shape of the excretory bladder and the absence of a muscular sphincter around the genital pore.

The other two species, *Bucephalopsis fisiformis* Verma and *B. magnum* Verma, differ in the measurements from the type-species, and the latter also differ in the configuration of vitellaria and in the size and shape of the cirrus sac.

M. N. D.

364. SRIVASTAVA, H. D.—Studies on the Amphistomatous parasites of Indian food fishes. Part. I. Two new genera of Amphistomes from an Indian freshwater fish, *Silundia gangetica* Cuv. & Val. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 367–374, (1938).

The author describes two new genera and a new species of Amphistomes from the Indian freshwater fish, *Silundia gangetica*. The two new genotypes *Nicollodiscus gangeticus* and *Orientodiscus lobatum* and the new species *Orientodiscus jumnai* are described in detail.

M. N. D.

365. SRIVASTAVA, H. D.—A new Gorgoderid trematode from the urinary bladder of an Indian migratory fish, *Belone strongylura*. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 391–394, (1938).

The author describes a new species of Gorgoderid trematode, *Phyllodistomum lewisi*, parasitic in the urinary bladder of an Indian migratory fish, *Belone strongylura*, collected in the rivers Ganges and Jumna at Allahabad.

M. N. D.

366. SRIVASTAVA, H. D.—Studies on the Amphistomatous parasites of Indian food fishes. Part II. A new trematode of the genus *Gyliauchen* Nicoli from an Indian marine fish. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 399–402, (1938).

The author records the presence of a common trematode parasite in the intestine of a marine fish, *Harpodon nehereus* Ham., in the Arabian Sea. It is described as a new species, *Gylianchen ozakii.* Of the two hitherto described species of this genus, *G. ozakii* resembles the type-species in the general shape of the digestive system, the course of the vitelline ducts and the size of eggs; it differs in the course of the oesophagus, the posterior extent of the coeca, the extent of the vitellaria, the absence of cirrus sac, the presence of a peculiar genital sinus and, finally, in measurements.

M. N. D.

367. Srivastava, H. D.—New Allocreadiids (Trematoda) from Indian marine food fishes. Part III. *Pedunculacetabulum pedicellata* n.sp. from the gut of *Chiloscyllium indicum. Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 403–406, (1938).

The author describes a new species, *Pedunculacetabulum pedicellata,* from the intestine of the Indian marine food fish, *Chiloscyllium indicum* at Puri (Bay of Bengal).

M. N. D.

368. Stanford, J. K.—Bird notes from the dry zone of Upper Burma. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 571–574, (1938).

The author records notes on some 32 birds occurring in the dry zone (Myingyan and Chindwin) of Upper Burma. The ornithology of that region is not well known.

M. L. R.

369. Stanford, J. K. and Ticehurst, C. B.—On the birds of Northern Burma. Part I. *Ibis*, II (14th Ser.), pp. 65–102, (1938).

In this series, of which the present paper is the first part, the authors propose to give the systematics and other related notes on the birds of Northern Burma, mostly the Myitkyina District. Part I deals with the physical features of the country and also contains an account of a portion of the order Passeres, some 58 species being dealt with. The authors also mention in the Introduction that they found 40 species new to Burma, and 9 species new to the avifauna of India as a whole. The latter are: (1) *Suthora unicolor canaster*; (2) *Phylloscopus subaffinis*; (3) *Pomatorhinus ferruginosus stanfordi*; (4) *Drymocataphus tickelli ochraceous*; (5) *Fulvetta manipurensis yunnanensis*; (6) *Siva strigula yunnanensis*; (7) *Otocompsa jocosa jocosa*; (8) *Iole virescens propinquus*; (9) *Horeites brunnifrons umbraticus.*

M. L. R.

370. Stanford, J. K. and Ticehurst, C. B.—On the birds of Northern Burma. Part II. *Ibis*, II (14th Ser.), pp. 197–229, (1938).

In this part the authors deal with a further instalment of 110 species of the birds of Northern Burma.

M. L. R.

371. Stanford, J. K. and Ticehurst, C. B.—On the birds of Northern Burma. Part III. *Ibis*, II (14th Ser.), pp. 391–428, (1938).

This is the third part of the series and deals with 120 species and subspecies, beginning with blackbirds and ending with wren-warblers, and covering the families Turdidae (part), Muscicapidae, Pericrocotidae and Sylviidae.

M. L. R.

372. Stanford, J. K. and Ticehurst, C. B.—On the birds of Northern Burma. Part IV. *Ibis*, II (14th Ser.), pp. 599–638, (1938).

In this part the authors deal with some 95 species and subspecies, beginning with blue birds and ending with broadbills.

M. L. R.

373. **Stoney, R. F.**—Woodcock, Wood Snipe, Pintail Snipe and Jack Snipe in one day. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 331, 332, (1938).

The author shot all these four species of birds on Feb. 16, 1938, near Ootacamund (South India). The weights of the snipes were: Woodcock 11⅝ oz.; Wood Snipe 5½ oz.; Pintail Snipe 4¾ oz.; and Jack Snipe 2 oz.
M. L. R.

374. **Subramaniam, M. K.**—On *Myzostoma gopalai* species nova from the Madras Harbour. *Proc. Ind. Acad. Sci.* (B), VIII, pp. 270–276, (1938).

A new species of Myzostome is described in detail. It occurs attached to the ventral surface of the arms of crinoides in the Madras Harbour. The best method of preserving these animals is given.
K. K. N.

375. **Subramaniam, T. V.** and **Anantanarayanan, K. P.**—A note on *Metanastria hyrtaca* Cram. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 257–263, (1938).

The author gives here the life-history of *Metanastria hyrtaca* Cram. and describes and illustrates its different stages. A list of the food plants of this moth is recorded and remedial measures suggested for their destruction.
S. R.

376. **Subramaniam, T. V.**—Some species of the Scolytidae (Coleoptera) from Mysore, with special references to the occurrence of *Stephanoderes hampei* Ferr, in dry cotton fruit stalks and carpels. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, pp. 175, 176 (1938).

377. **Theodor, O.**—On sandflies (*Phlebotomus*) from Ceylon, Siam and Malay. *Ind. Journ. Med. Res.*, XXVI, pp. 261–269, (1938).

The author gives notes and figures of seven known species and varieties of *Phlebotomus* from Ceylon, Siam and Malay and describes and figures the following 3 new forms:—*Phlebotomus babu insularis*, var. nov., from Ceylon, *P. barraudi* (?) var. nov., from Siam and *P. iyengari malayensis*. var. nov., from Malaya.
S. R.

378. **Ticehurst, C. B.**—On *Saxicola maura* and *Saxicola indica*. *Ibis*, II (14th Ser.), pp. 338–341, (1938).

The author, after examining both Russian and Indian material, comes to the conclusion that *S. indica* (the Indian bird) should be kept separate from *S. maura* (the Russian bird) 'on the slightly smaller wing-measurements and the less amount of white in the base of the tail, though no doubt not every specimen could be separated'.
M. L. R.

379. **Vidyarthi, R. D.**—Avian trematodes on the genera *Neodiplostomoides*, nov. gen., *Bolbophorus* Dubois, 1934, and *Glossodiplostomum* Dubois, 1932. *Parasitology*, XXX, pp. 33–39, (1938).

The author establishes a new genus *Neodiplostomoides*, with *N. mehrii* as genotype, a new species *Glossodiplostomum hieraetii* from the small intestine of Bonell's Eagle, *Hieraetus fasciatus fasciatus*, and two new species *Bolbophorus orientalis* and *G. buteoides* from the small intestine of *Butio rufinus rufinus*, from Allahabad.
M. N. D.

380. **Waite, H. W.**—Some interesting records of birds in the Punjab. A correction. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 328, 329, (1938).

The author points out that in the note 'Some interesting records of birds in the Punjab' (*Journ. Bombay Nat. Hist. Soc.*, XXXIX, p. 861) the bird recorded as ♀ *Chrysocolaptes guttacristatus sultaneus* is really *Dinopicum shorei* (Gould), the Himalayan Golden-backed Three-toed Woodpecker, which also is new to the Punjab List.

M. L. R.

381. **Waite, H. W.**—Occurrence of the White-headed Wagtail, *Motacilla flava leucocephala* (Przewalski), in the Attock District of the Punjab. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 561, (1938).

The author records the occurrence, in the Attock Dist., Punjab, on April 27, 1938, of a ♂ *Motacilla flava leucocephala* (Prz.) from amongst a number of *M. f. beema*. There is only one previous record of this bird from India, Whistler having obtained a ♂ at Jhelum on May 2, 1913 (*Ibis*, 1916, p. 75).

M. L. R.

382. **Werner, F.**—Reptilien aus Iran und Beluchistan. *Zool. Anz.*, CXXI, pp. 265–271, (1938).

This is a report upon the small but interesting collection of reptiles made by Herr Gabriel in 1937 from Iran and parts of Baluchistan. Among the Testudinata were found *Testudo zarudnayi* Nik.; among the Lacertilia, *Agamura cruralis* Blanf., *Bunopus biporus* (sp. nov.), *Agama agilis* Oliv., *Agama nupta* de Fil., *Phrynocephalus olivieri* Db., *P. maculatus* And., *Acanthodactylus cantoris blanfordi* Blngr. and *Eremias velox persa* Blanf.; and among the Ophidia, *Typhlops vermicularis* Merr., *Coluber rhodorhachis* Jan., and *Lytorhynchus gabrielis* (sp. nov.).

M. L. R.

383. **Whistler, H.**—The ornithological survey of Jodhpur State. *Journ. Bombay Nat. Hist. Soc.*, XL, pp. 213–235, (1938).

This paper embodies a report on the collection of birds in the Jodhpur State (Rajputana) made by the Bombay Natural History Society in 1933. Some 256 species are mentioned.

M. L. R.

384. **Williams, J.**—Game birds in the Annamalai Hills and the South Coimbatore District. A correction. *Journ. Bombay Nat. Hist. Soc.*, XL, p. 570, (1938).

The author points out that he might have been mistaken in identifying the Pintail and the Fantail Snipes, and also the Mallard (*J.B.N.H.S.*, XXXIX, p. 732). Only future finds of these birds in that area can settle the question of their occurrence and abundance.

M. L. R.

ANTHROPOLOGY

(including Ethnology).

General.

385. **Bose, Atindranath**—Animal Preservation among the Aryans. *Indian Review*, XXXIX, pp. 601–606, (1938).

The author studies the ideas of animal preservation current amongst the ancient Indo-Aryans and remarks that the Aryan settlers who came to India by clearing the forests found cattle of different kinds rich in milk for their own use as well as for sacrificial rites. They also devised various means for their preservation.

B. K. C.

386. **Bulsara, J. F.**—In how far national or racial cultures are distinct from one another. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 192, (1938).

387. **Bulsara, J F.**—Language as an aid and obstacle to accurate thinking. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 204, (1938).

388. **Chakladar, H. C.**—Anthropology at the Calcutta University. *Zeitschr. f. Rassenkunde*, VIII, p. 91, (1938).

In this note the author summarises the growth of anthropological studies in the University of Calcutta.

B. K. C.

389. **Cipriani, Lidio**—Anthropological research in South India. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 196, (1938).

390. **Correia, Germano da Silva**—Anthropology in India and Ethnical position of Indians. *Journ. Ind. Anthrop. Inst.*, I, pp. 29–40, (1938).

The author discusses in detail the ethnical positions of the different castes and tribes in the Indian population.

A. K. M.

391. **Eickstedt, Baron Von**—The crisis in modern Anthropology. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 194, (1938).

392. **Fernandes, A. Correia**—The Population Problem. *Modern Review*, LXIV, pp. 701–708, (1938).

The author studies the population problem of India and points out that the neo-Malthusian population policy, if adopted in India, may produce serious moral, social and even economic disintegration which are the nightmare of European statesmen and economists of to-day.

A. K. M.

393. **Fleure, H. J.**—The Idea of the Nation in Europe. *Science and Culture*, III, pp. 453–457, (1938).

The author after tracing the history of the different European countries from the Neolithic times and the gradual development of the city life associated with climatic changes of the country recommends such a line of research in India. Though the cities in the Mediterranean lands had developed earlier, the concept of a nation came from the North-West only in the 19th century; the nucleus of national ideas grew during this time in Germany with differences in marked contrast to those of England and France. In conclusion, the author expresses the views that (*a*) common ideas and experiences are a great aid to national unity, (*b*) deep rifts in opinion and their consequent methods of suppression result in setbacks to communities, (*c*) a common measure is a difficult policy for a nation and new synthesis is needed for transcending the deep rifts, and (*d*) the organisations of national character should not be on too wide a scale. The author looks forward to the Indian Federation, with freedom for the various dissimilar units, which may help on to the evolution of a European Federation.

S. S. S.

394. **Hutton, J. H.**—Future of Anthropology in India. *Journ. Ind. Anthrop. Inst.*, I, pp. 1–9, (1938).

The author stresses the need of a thorough survey of India from various aspects of Anthropology.

A. K. M.

395. **Hutton, J. H.**—Anthropology as an Imperial Study. *Nature*, CXLI, pp. 699, 700, (1938).

The author has shown how some of the subject races living within a great imperial organisation, such as the British Empire, are gradually disappearing as a result of various hardships, and, in support, has given examples from the various Indian aborigines.

S. S. S.

396. **Kuriyan, George**—Population and its Distribution in Kerala. *Journ. Madras Geog. Assoc.*, XIII, pp. 125–146, (1938).

According to the author the density of population in Kerala is higher than that of any other provinces of India except Delhi, which is one of the most densely populated parts in the world. He also points out that in an agricultural country like Kerala, the factors that govern the density of population are chiefly those concerned with the cultivation of crops and the distribution of produce.

A. K. M.

397. **Majumdar, D. N.**—Our Museums—A plea for an Ethnographic section. *Science and Culture*, III, pp. 591–593, (1938).

The author after reviewing the utility of Museums for the better understanding of the different communities in India has urged the necessity of ethnographic sections to be added to all museums in India, which at present are mainly devoted to archæological exhibits.

S. S. S.

398. **Majumdar, D. N.**—Tribal population and Christianity. *Modern Review*, LXIII, pp. 513–516, (1938)

The author pleads for an organised mission work among the tribal people of Chota Nagpur.

A. K. M.

399. **Mitra, A.**—The Origin of Wheat and a few other cultivated plants. *Science and Culture*, III, pp 643–647, (1938).

The author refers to the finds of wheat in the Indus Valley and other prehistoric sites and supports Vavilov's theory of dual origin of wheat. In discussing barley, rye, oat, rice, potato and sugarcane the author describes Vavilov's method of geographical distribution of characters in studying the origin of crops.

S. S. S.

400. **Nag, Kalidas**—The Polynesian World. *Calcutta Review*, LXVII, pp. 68–84, (1938).

The author reviews the published works on Polynesian culture and refers to the cultural ebb and flow between the Indian and the Pacific Oceans from very early times.

A. K. M.

401. **Ogilvie, A. C.**—The technique of Regional Geography with special reference to India. *Journ. Madras Geog. Assoc.*, XIII. pp. 109–124, (1938).

The author lays stress on the study of Human Geography in India.

B. K. C.

402. **Roy, David**—The place of the Khasis in the world. *Man in India*, XVIII, pp. 122–134, (1938).

The author describes the individual position of the Khasis.

A. K. M.

403. **Roy, Sarat Chandra**—An Indian Outlook on Anthropology. *Man*, XXXVIII, pp. 146–150, (1938).

The author considers that Cultural Anthropology should not only be limited to the study of the lower cultures of aboriginal tribes, but should also include those of the advanced peoples.

A. K. M.

404. **Roy, Sarat Chandra**—A plea for a new outlook in Anthropology. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 193, (1938).

405. **Roy, Sarat Chandra**—The study of Anthropology from the Indian point of view. *Journ. Benares Hindu Univ.*, II, pp. 243–56, (1938).

In this paper the author expresses his views regarding what should be the ulterior aim of Anthropology from an Indian point of view. According to him, the object of the science of man should be to understand the meaning and goal of human existence,—the trend, direction and aim of human civilisation and the eternal spiritual reality behind life and society.

A. K. M.

406. **Roy, Sarat Chandra**—Bhāratēr Mānav O Mānav Samāj. *Sāhitya Parisad Patrikā* (in Bengali), XXXXV, pp. 232–262, (1938).

The author studies the racial and cultural history of India in detail and pleads for an universal brotherhood.

A. K. M.

407. **Sahni, M. R.** and **Mrs. Shyama Sahni**—The Palaungs of the Shan hinterland. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 200, (1938).

408. **Srinivasachari, C. S.**—Pre-Dravidian, Proto-Dravidian and Dravidian. *Journ. Bihar and Orissa Res. Soc.*, XXIV, pp. 29–56, (1938).

The author discusses the theories regarding the origin and cultures of the Pre-Dravidian, Proto-Dravidian and the Dravidian as put forward by different scholars and the theory of the Dravidian origin of the Mohenjo-Daro Civilisation.

A. K. M.

409. **Thomas, F. W.**—Considerations concerning the Ethnology and Early History of the countries bordering on Tibet. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 195, (1938).

ETHNOGRAPHY (Material Culture and Descriptions of Tribes).

410. **Altekar, A. S.**—Dress and Ornaments of Hindu Women. *Journ. Benares Hindu Univ.*, II, pp. 399–422, (1938).

This article is based on a chapter of the author's book 'Women in Hindu Civilisation', in which he begins his study from the Vedic period down to recent times.

A. K. M.

411. **Beasley, H. G.**—A Silver 'Petat' from East Java. *Man*, XXXVIII, p. 105, (1938).

The author describes a Javanese silver ornament representing a bird which is similar in appearance to the '*Garūda*' of India.

A. K. M.

412. **Bhattasali, N. K.**—Wooden Sculptures of Bengal. *Modern Review*, LXIII, pp. 261–266, (1938).

The author gives a summary of the wooden sculptures of Ancient Bengal with illustrations.

B. K. C.

413. **Bonnerjea, Biren**—Ugrian Fishing Implements and some Indian Parallels. *Man in India*, XVIII, pp. 225–263, (1938).

The author has shown certain similarities in the art of fishing between the Finno-Ugrians of Europe and the Mundas of Central India.

B. K. C.

414. **Bose, Nirmal Kumar**—Saraikela Rājyē Taila Nishkāshana Yantra. *Sahitya Parisad Patrika* (in Bengali), XXXXV, pp. 169–179, (1938).

The author studies five types of oil press of the Saraikela State and discusses their origin and points out that there is certain prejudice against the manufacture of oil by certain types of oil press.

B. K. C.

415. **Chatterjee, Asoke**—Art in primitive and ancient life. *Modern Review*, LXIII, pp. 379–383, (1938).

The author studies the art in primitive life and remarks that even if we assume the all-pervading sway of the totem and magic over primitive life, we need not necessarily discard the aesthetic elements present in it. Primitive art may be different in quality, sharpness and in its aesthetic contents, but nevertheless they have a distinctive feature of their own.

B. K. C.

416 **Chattopadhaya, K. P.**—Indian oil presses and oil extractions. *Journ. Ind. Anthrop Inst.*, I, pp. 42–61, (1938).

In this article the author describes and illustrates the different types of oil presses used in India.

B. K. C.

417. **Codrington, K. de B.**—Bara Gari, the dragging of the twelve carts. *Man*, XXXVIII, pp. 163–168, (1938).

The author gives a detailed description of the 'Bara Gari' ceremony performed by the Kunbis and Mhars of Faradpur in H.E.H. the Nizam's Dominion,—as a fulfilment of a pledge. The intrusion of a Muhammedan into this Hindu ceremony is very interesting and points to similarities between the ceremony and the hook-swinging festival (Charak Puja) of Southern India and Bengal.

B. K. C.

418. **Das Gupta, C. C.**—A type of Sedentary game prevalent in the United Provinces of Agra and Oudh. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 121, 122, (1938).

419. **Datta, Jitendra Mohon**—A new and rare type of *Mughal-Pathan* found near Calcutta. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 283, 284, (1938).

420. **Gode, P. K.**—The antiquity of the Hindoo nose ornament called '*Nath*'. *Annals Bhandarkar Orient. Res. Inst.*, XIX, pp. 313–334, (1938).

In this article the author gives references to articles on nose ornaments and attempts to trace their origins.

A. K. M.

421. **Fürer-Haimendorf, Christoph Von**—Naga Head-Hunters' Women-folk: Dress, Ornament, and Customs. *Ill. Lond. News*, 193, pp. 60, 61, (1938).

Life among the head-hunting Nagas in the remote hilly country between Assam and Burma has been described with notes and illustrations. A. K. M.

422. **Fürer-Haimendorf, Christoph Von**—'Sport' among Konyak Naga Head-Hunters. *Ill. Lond. News*, 193, pp. 1192, 1193, (1938).

A short description is given with illustrations of the every-day life and some of the social customs of the head-hunting Konyak Nagas. A. K. M.

423. **Fürer-Haimendorf, Christoph Von**—Through the Unexplored Mountains of the Assam-Burma Border. *The Geog. Journ.*, XCI, pp. 201–216, (1938).

The author accompanied a punitive expedition, led by Mr. J. P. Mills, among the Kalyo Kengyu Nagas on the western slopes of the Patkoi Range, wherefrom he was able to carry with him the human head trophies of the Konyak Nagas and took the opportunity of seeing the head-taking dance of the latter tribe. The author has also given ethnological details of some customs of the neighbouring Naga tribes. S. S. S.

424. **Gangooly, Bireswar**—Burmese Eras, Years, Months and Days. *Modern Review*, LXIII, pp. 672–675, (1938).

In this paper the author has shown that the Burmese astronomy was originally taken from India. A. K. M.

425. **Hornell, James**—Boat Oculi Survivals: Additional Records. *Journ. Roy. Anthrop. Inst.*, LXVIII, pp. 339–348, (1938).

In this paper the author records a number of new and important instances of the use of oculi on boats, in continuation of his paper 'Survivals of the Use of Oculi in Modern Boats' (*J.R.A.I.*, LIII, pp. 289–321). Dual origin of the use of the oculi is suggested: (i) a counter charm against the evil eye and misfortune, as in the Mediterranean, and (ii) a belief in the presence within the vessel itself of a guardian deity, the soul of the boat. The latter idea is said to be prevalent in India as well. A. K. M.

426. **Kauffmann, H. E.**—Die Fallen der Thadoa-Kuki in Assam. *Zeitschr. f. Ethnologie*, Heft 1/2, pp. 1–18, (1938).

The author describes, with diagrams, 22 kinds of various traps used by the Thadoa-Kukis of Assam. S. S. S.

427. **Subramanyam, K. M.**—Four Main House Types in South India: Their Geographic Control. *Journ. Madras Geog. Assoc.*, XIII, pp. 168–175, (1938).

In this article the author discusses the four different types of house of South India, *viz.*, (1) the Ceded District type, (2) the Malabar type, (3) the Northern Circars type, (4) the Tamilnad type, and points out the influence exerted by geographical conditions on the building of houses in S. India. B. K. C.

428. **Thakkar, A. V.**—Aborigines of Orissa. *Modern Review*, LXIV, pp. 328–330, (1938).

The author publishes a list of the areas inhabited by the aboriginal people of India which are wholly or partially excluded from the Provincial Autonomy, and points out that of all the tracts the provinces of Bihar, Orissa and Assam seem to be the worst sufferers. The author deplores the lack of love and sympathetic feelings of the Hindus towards the primitive people.

A. K. M.

PREHISTORIC ARCHAEOLOGY.

429. **DAS GUPTA, C. C.**—Bibliography of Ancient Indian terracotta figurines. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 67–120, (1938).

430. **DE HEVEZY, G.**—The Easter Island and the Indus Valley scripts. *Anthropos*, XXXIII, pp. 808-814, (1938).

A reply to Metraux's criticisms of the association of the Easter Island tablet signs with the Indus Valley scripts.

B. K. C.

431. **FABRI, C. L.**—The Age of the 'Indus Valley Civilisation'. *Current Science*, III, pp. 433–436, (1938).

The author has attempted to establish a similarity between the Indus Valley, the Egyptian and the Sumerian cultures and is of opinion that they are contemporary. He dates it between 2800–2500 B.C. and agrees with the views of the German scholars, who call it a 'Spatkultur', on the ground that a civilisation of such a high order must have taken several thousands of years for its evolution and development.

S. S. S.

432. **GANGULI, K. K.**—A note on the nose ornament in Mohenjo-Daro. *Indian Culture*, V, pp. 342, 343, (1938).

The author criticises Mackey's identification of certain objects, such as nose ornaments, found in the excavation of Mohenjo-Daro and is of opinion that the theory on which Mr. Mackey based his arguments in favour of his identification does not appear to be substantiated by evidence.

A. K. M.

433. **GHOSH, J. C.**—Antiquity of Gaya. *Journ. Bihar and Orissa Res. Soc.*, XXIV, pp. 89–111, (1938).

The author has endeavoured to show that in the Rig-Vedic period, the Vedic Aryans advanced as far as the outskirts of Magadhā and the earlier settlers of Magadhā were the Magas (probably the ancestors of the Gayali Brahmans).

A. K. M.

434. **GORDON, D. H.**—The Microlithic Industries of India. *Man*, XXXVIII, pp. 21–24, (1938).

The author gives a list of microlithic sites of India and shows that this industry stretched from Sind on the West to Orissa on the East, and from Mirzapur on the North to Cuddapah on the South.

B. K. C.

435. **GORDON, D. H.**—More Microlithic sites of India. *Man*, XXXVIII, pp. 63, 64, (1938).

The author gives a further list of microlithic sites of India which were not included in his article on the 'Microlithic Industries of India' (*Man*, Art. 19, 1938).

A. K. M.

436. **GORDON, D. H.**—Pre- and Proto-Historic Archaeology in India. *Journ. Ind. Anthrop. Inst.*, I, pp. 11–22, (1938).

The author describes some of the Pre- and Proto-historic archaeological sites of India and stresses the necessity of exhaustive study in this line.

B. K. C.

437. **Goswami, Kunjagobinda**—Excavation at Bāngarh. *Calcutta Review*, LXVII, pp. 184–193, (1938).

The author gives a preliminary account of the excavations of a site, probably of Gupta period, at Bangarh, District Dinajpur, Bengal. The examination of the bricks found here in the lower level has revealed that this structure can be associated with the Gupta period. The most interesting finds are:—(*a*) an image of Sadāsiva, (*b*) an image of Pārvati (four-handed) with Kārtikeya on her left and Ganesa on the right, (*c*) a stone pillar base with decorative figures on all sides, (*d*) a fragment of the image of Harapārvatī, (*e*) a fragment of a small ten-handed image of Durgā and a few other fragments of images.

A. K. M.

438. **Heras, H.**—Proto-Indian Sign from Vala. *Quart. Journ. Myth. Soc.*, XXVIII, pp. 141–143, (1938).

The author in the note describes an earthen knob lid unearthed in the course of excavations of a Buddhist monastery in Vala, the ancient Vallabhipur (Kathiawar). He further points out that similar lids have also been discovered at Mohenjo-Daro, Sari-Dheri and at Jamdet-Nasr.

A. K. M.

439. **Heras, H.**—The Story of two Mohenjo-Daro Signs. *Journ. Benares Hindu Univ.*, II, pp. 1–6, (1938).

The author discusses the significance of two of the inscriptions on the Mohenjo-Daro seals.

A. K. M.

440. **Heras, H.**—The Origin of the Mohenjo-Darians. *Journ. Benares Hindu Univ.*, II, pp. 7–12, (1938).

The author criticises the views of Dr. Pran Nath on the script of Mohenjo-Daro, on philological grounds. Dr. Pran Nath regards the script as Proto-Aryan, while the author considers it to be Proto-Dravidian and supports his view with illustrations.

A. K. M.

441. **Heras, H.**—The Eastern Island and Script of Mohenjo-Daro. *Annals Bhandarkar Orient. Res. Inst.*, XIX, pp. 122–126, (1938).

As a result of a comparative study of the scripts of Easter Island and Mohenjo-Daro the author concludes that the discrepancies between the two vocabularies, as well as the doubtful antiquity of the tablets themselves, prove beyond doubt that the scripts of Mohenjo-Daro and the Easter Island are not related to each other and that the similarity existing between the signs of the two scripts is merely coincidental.

A. K. M.

442. **Iyer, L. A. Krishna**—The Significance of Megalithic Monuments. *Quart. Journ. Myth. Soc.*, XXIX, pp. 58–61, (1938).

According to the author, the dolmens that are now erected by the few tribes in India and Burma are not of the same size as is characteristic of the pre-historic period, and he is of the opinion that the builders of the pre-historic megaliths were on a higher level of culture than their present descendants.

A. K. M.

443. **Krishnaswami, V. D.**—Environmental and Cultural Changes of Prehistoric Man near Madras. *Journ. Madras Geog. Assoc.*, XIII, pp. 58–90, (1938).

In this article the author studies the cultural changes of pre-historic man near Madras, and deals with the problem of geology and physiography of the area, the human industries and cultural sequences and the typology of the industries. A comparative study of this pre-historic stone industry is also made with Africa and Java.

A. K. M.

444. **Mazumdar, N. G.**—The Nal pottery. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 195, (1938).

445. **Mehta, Ratilal**—Local Government in pre-Buddhist India. *Modern Review*, LXIII, pp. 656–659, (1938).

The author discusses the administration of the villages, in so far as it is reflected in the *Jataka* stories. *Jataka* stories give us a real picture of the life and thought of the period just preceding that of the Buddha and which can well be called *Mahājanapada*, *i.e.* the period approximately ranging from 600 B.C. to 800 B.C. A. K. M.

446. **Metraux, A.**—The Proto-Indian Script and the Easter Island Tablets. *Anthropos*, XXXIII, pp. 218–239, (1938).

The author discusses de Hevezy's views connecting the Easter Island tablet signs with the scripts of Harappa and Mohenjo-Daro seals. S. S. S.

447. **Metraux, A.**—Two Easter Island Tablets in Bernice Pauhi Bishop Museum, Honolulu. *Man*, XXXVIII, pp. 1–4, (1938).

The author exposes the faked evidence on which the views of Mr. de Hevezy are based on the striking parallels between the pictographic scripts of Mohenjo-Daro, Harappa and certain signs of the tablets of Easter Island. A. K. M.

448. **Misra, Binayak** and **Panigrahi, K. C.**—Exploration of Dengaposhi in Keonjhar State. *Modern Review*, LXIII, pp. 301–305, (1938).

449. **Mookerji, Radhakumud**—New Light on Ancient India. *Science and Culture*, IV, pp. 316–318, (1938).

The author has shown how the science of plant genetics is throwing new light on the origins of civilisation and to this effect he briefly discusses Vavilov's researches on wheat and other cereals. The author concludes by mentioning the researches on Early Man in India and is of the opinion that India was at one time the cradle of the human race and civilisation. S. S. S.

450. **Nath, R. M.**—Antiquities of the Kapili and the Jamuna Valleys. *Journ. Assam Res. Soc.*, V, pp. 14–57, (1938).

The author gives an exhaustive list and describes the archaeological antiquities so far found in the various districts of Assam. B. K. C.

451. **Nath, R. M.**—Ancient remains at Singri in Darrang. *Journ. Assam Res. Soc.*, V, pp. 109–112, (1938).

A further elucidation of the theories advanced in connection with temple ruins by Sj. Sarbeswar Kakati, published in the *Journ. Assam Res. Soc.*, V, pp. 93–95, (1937). A. K. M.

452. **Prashad, B.**—The Bearing of the Domestication of Animals on Human Civilisation, with particular reference to India. *Science and Culture*, III, pp. 408–416, (1938).

The author reviews the current theories of organic evolution and special creation, the age of mammals and the appearance of Man and his wanderings and comes to the conclusion that the migrations of the various races on a large scale were subsequent to the domestication of several classes of animals. He traces the history of the domestication of animals from prehistoric times, and refers to the skeletal remains of the various animals and their representations in terracotta and other objects, discovered in the Indus Valley excavations, and gives his views in regard to the various types of domestic animals found at Harappa.

S. S. S.

453. **Raghavan, M. D.**—A pre-historic site within the city of Madras. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 206, (1938).

454. **Sahni, B.**—The coining technique of the Yaudheyas. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 195, (1938).

455. **Saraswati, Sarasi Kumar**—Early Sculpture of Bengal. *Journ. Dept. Letters Cal. Univ.*, XXX, pp. 1–85, (1938).

The author studies the sculptures of Bengal (especially that of Paharpur) from early times and indicates their affinity with other Schools of Art in India. He remarks that the 7th and 8th centuries may be looked upon as the periods when the political and cultural history of Bengal was at its highest.

B. K. C.

456. **Sen, D.**—Further discoveries of Palaeolithic cultures in the North-West Punjab. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 196, (1938).

457. **Sen, D.**—Pre-historic Cultures and Ancient River Valleys in India. *Calcutta Review*, LXVII, pp. 91–96, (1938).

The author gives a summary of the geological conditions of the Ganges, Nurbudda and the Godavari valleys as well as the Himalayan regions.

A. K. M.

458. **Sen Gupta, P. C.**—Bhārata-Battle Traditions. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 393–413, (1938).

The author critically examines the two traditions regarding the date of the Bhārata-Battle, *viz.*, (i) the Āryabhaṭa tradition (3102-3101 B.C.) and (ii) the *Puranic* tradition or traditions which state that the time-interval between the birth of Parīkṣit to the accession of Mahāpadma Nanda, was either 1,015, 1,050, 1,115, or even 1,500 years.

B. K. C.

459. **Sen Gupta, P. C.**—Solastic Days in Vedic Literature. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 415–434, (1938).

The author concludes that the Vedic Hindus knew of a method for finding out the solastic day of any year, and claims to have found out a chronological ladder extending from 3550 B.C. to 2100 B.C. during which the class of Sanskrit literature known as the Brahmanas was developed.

A. K. M.

460. **Sen Gupta, P. C.**—Madhu-Vidyā or the Science of Spring. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 435–443, (1938).

The author attempts to interpret the Madhu-Vidyā or the Science of Spring of the Vedic Hindus, and concludes that in the absence of epigraphic records, we have to rely on literary evidences alone for finding out the antiquity of the Vedas. He is of the opinion that the civilisation of the Vedic Hindus was earlier than that of Indus Valley as evidenced by the remains of Mohenjo-Daro.

B. K. C.

461. **Wright, Phillip**—The Enigma of Græco-Buddhist Art in India. *Ill. Lond. News*, 193, pp. 1189–1191, (1938).

PHYSICAL ANTHROPOLOGY AND RACIAL BIOLOGY.

462. AIYAPPAN, A.—Social and Physical Anthropology of the Nayadis of Malabar. *Bull. Madras Govt. Mus.*, N.S. General Sec., II, pp. 1–141, (1938).

The author measured 62 male and 42 female Nayadis of Malabar and is of opinion that physically the Nayadis can be placed in between the hill tribes and castes of the plains. He further deals with their social customs and usages. B. K. C.

463. BASU, MINENDRANATH—Anthropo-Psychometrical Investigation among the Noluas of Bengal. *Ind. Journ. Psych.*, XIII, pp. 153–160, (1938).

The author determined the Simple Reaction Time (muscular and sensorial) of the 'Noluas' by means of a Vernier Chronoscope. He also studied the span of memory of the same people and concludes that the memory span of the 'Noluas' is lower than that of the common people of Bengal, but higher than that of the 'Bunas'. B. K. C.

464. BASU, MINENDRANATH—Blood pressure of the Noluas of Bengal. *Man*, XXXVIII, p. 119, (1938).

The author's measurements of the blood pressure of 200 Noluas from 4 districts of Bengal are recorded in this article. B. K. C.

465. BASU, M. N.—Blood Groups of the Noluas of Bengal. *Nature*, CXLI, p. 649, (1938).

100 Noluas (basket-makers), 25 each from four different districts of Bengal, were grouped serologically, showing the following percentages:—O, 16%; A, 38%; B, 33%; AB, 13%. S. S. S.

466. BASU, R. N.—Blood Groups among the Khasis. *Nature*, CXLII, p. 797, (1938).

Blood samples of 50 Khasis of Assam were tested, showing the following percentages of the four groups:—O, 46·6%; A, 15·6%; B. 33·3%; AB. 4·5%. S. S. S.

467. BASU, R. N.—Studies in Eyebrows among the Bengalis. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 203, (1938).

468. BASU, SUSHIL KUMAR—Medico-legal aspects of the determination of age of Bengalee girls. *Ind. Med. Record*, LVIII, pp. 97–100, (1938).

The author attempts to fix the age of diaphysio-epiphysial union in the Bengalee girls after studying 130 subjects under X'Rays and gives a comparative table of the age of such unions in other countries as investigated by different authors. B. K. C.

469. BISWAS, P. C.—Studies on the heredity of the palmar pattern. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 200, (1938).

470. BISWAS, P. C.—Studies of the whorl on head-hair in Bengalis. *Zeitschr. f. Rassenkunde*, VIII, pp. 343-344, (1938).

The author analyses the hair-whorl of 200 Bengalis and concludes that the clockwise direction of the whorl occurs in large numbers and double-whorl appear in lesser proportion than the single whorl. In double-whorl, clockwise-anticlockwise is more frequent than clock-wise-clockwise. B. K. C.

471. BISWAS, P. C. and CHAUDHURI, B. K.—On the palmar prints of the Oriyas. *Journ. Dept. Science, Cal. Univ.*, I, pp. 111–129, (1938).

The authors have studied one hundred hands of the Oriyas and come to the conclusion that the palm prints of the Oriyas show less similarity with the Yellow races. The similarity in the Main line formulae and appearance of pattern loop on the Hypothenar and on the III and IV Interdigital areas show that the Oriyas stand nearer to the Europeans and the Ainus.

B. K. C.

472. BOSE, H. K.—A comparative study of the Athgarh (Orissa) skull. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 204, (1938).

473. CHAKLADAR, H. C.—Comparative anthropometry of the Pundits and Muhammadans of Kashmir. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 201, (1938).

474. CHAKRAVARTY, M. L.—Blood sugar of the normal Bengali—its inter-relationship with some body measurements. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 204, (1938).

475. CHATTERJEE, A.—The Bengalee School-boy—his physical development. *Zeitschr. f. Rassenkunde*, VIII, pp. 53–61, (1938).

In this paper the author tabulates the results of his measurements of height, weight, height-weight index, chest and strength of grip of 33,151 Bengalee students of Calcutta and its suburbs. The figures for Vital Capacity are based on an examination of 7,722 individuals while that of Blood Pressure on 4,175.

B. K. C.

476. CHATTERJEE, A. N.—Height and Cephalic Index of the Bengali Students. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 196, (1938).

477. CIPRIANI, LIDIO—On the Anthropology of the Todas. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 198, (1938).

478. DASTUR, P. G.—Measurement of Indian Pelvis. *Journ. Univ. Bombay*, VI, pp. 31–34, (1938).

The author examined 106 pelves of which 87 were Dissection Room specimens with soft portions intact and 19 were from macerated bodies. Out of 87 from the Dissection Room specimens, 59 were males and 28 females. Only the averages of some of the measurements are given.

B. K. C.

479. DATTA, BHUPENDRA NATH—An enquiry into correlations between age and cephalic breadth, age and zygomatic breadth, cephalic breadth and zygomatic breadth of the people of Bengal. *Journ. Ind. Med. Assoc.*, VII, pp. 358–364, (1938).

The author as a result of his examination of 169 males from the Bengali-speaking people from nineteen districts of Bengal summarises the correlations between age and cephalic breadth; age and zygomatic breadth; cephalic breadth and zygomatic breadth of the people of Bengal.

B. K. C.

480. **Datta, Bhupendra Nath**—A note on the presence of the light coloured eye-iris amongst the population of North-Eastern India. *Man in India*, XVIII, pp. 1-8, (1938).

The author, by analysing the data collected by him from Bengal and Assam, shows the presence of grey and blue eyes among some conservative and endogamous castes belonging to the orthodox Hindu society. B. K. C.

481. **Datta, Bhupendra Nath** and **Mahalanobis, P. C.**—A note on the foot and stature correlation of certain Bengal castes and tribes. *Sankhyā*, III, pp. 245–248, (1938)

The authors have attempted to establish foot and stature correlation amongst Brahmins, Kayasthas and Santhals of Bengal and have come to the conclusion that the upper castes have a higher stature and a smaller foot-length and foot-breadth than the lower castes. The Santhals, a very primitive people, have the shortest stature, the longest foot-length and widest foot-breadth. B. K. C.

482. **Datta, Bhupendra Nath**—Anthropological notes on some Assam tribes. *Anthropological Papers* (*Cal. Univ.*), New Series, No. 5, pp. 1–26, (1938).

Studies on the comparative anthropology of some of the castes of Assam based on examination of 95 subjects. As a result of 29 measurements of each subject the author concludes that the groups are not widely divergent from one another and the so-called castes have no racial basis. B. K. C.

483. **Eickstedt, E. Frhr. V.**—Forschungen in Süd- und Ostasien. I. Travancore, Cochinchina und Kambodscha. *Zeitschr. f. Rassenkunde*, VIII, pp. 294–333, (1938).

The author gives the results of his investigations during his recent visit to the East when he studied the racial history of the short statured people (*Kleinwuchsformen*) as they occur in the Vedda and palaemongoloid peoples. He carried out anthropometric investigations of the Kanikars of Travancore, where he found a clear Melanid element. For the first time Eickstedt's *Tiefenmesser*, by which the facial relief can be measured, was employed. The author passed through Ceylon, Singapore and further eastwards to Cambodia through French Indo-China on his Anthropological Mission. S. S. S.

484. **Fisher, R. A.**—The functions of Physical Anthropology. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 197, (1938).

485. **Fleure, H. J.**—Racial Analysis. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 198, (1938).

486. **Guha, B. S.**—The Racial Composition of the Hindukush Tribes. (Presidential Address to the Anthropological Section of the Indian Science Congress, Calcutta, 1938.) *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, pp. 147–166, (1938).

The author recognises three distinct strains in the racial composition of the Hindukush tribes, namely a dark Oriental type forming the basis, an intermediate short-headed type, and a tall, long-headed fair race constituting the apex of the population with a certain amount of Mongoloid admixture specially in the Eastern section. B. K. C.

487. **Lowe, John**—A note on racial variations in leprosy with particular reference to India and Burmese races. *Ind. Med. Gaz.*, LXXIII, pp. 591–595, (1938).

The author has studied the leprosy problem of India, specially amongst the Burmese, and opines that a study of racial susceptibility in relation to the history of leprosy in the affected races is likely to produce interesting results. A. K. M.

488. **Macfarlane, E. W. E.**—Blood-Group distribution in India with special reference to Bengal. *Journ. Genetics*, XXXVI, pp. 225–237, (1938).

The author has grouped serologically 100 Brahmins and Kayasthas, 160 Mahishayas, 320 non-caste Hindus and 120 Muhammadans from Bengal and has shown that the percentages of A and B increase from higher to lower castes and the highest percentage of O is found among the caste Hindus. The highest percentage of B yet obtained in India is found among the depressed classes and it is probable that the mutation of R to A has been replaced at a later date by mutations of R to B and not of A to B. S. S. S.

489. **Macfarlane, E. W. E.**—The racial affinities of the Jews of Cochin. *Journ. Roy. As. Soc. Bengal, Lett.*, III, pp. 1–23, (1938).

This is a study of the Physical characters, Blood groups and some of the social customs of the Jews of Cochin. The author is of the opinion that the White Jews have preserved a Near Eastern and European strain and show no indications of admixture with Malayalis, while the Black Jews are the descendants of mixed Semitic and native Malayali ancestors.

S. S. S.

490. **Macfarlane, E. W. E.**—Inter-caste differences in blood group distribution in Bengal. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 199, (1938).

491. **Mahalanobis, P. C.**—On an improved model of the Profiloscope. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 206, (1938).

492. **Majumdar, D. N.**—The relationship of the Austric-speaking tribes of India with special reference to the Hos and Saoras. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 202, (1938).

493. **Majumdar, D. N.**—Racial Admixture in the United Provinces: Scientific Inquiry. *Man in India*, XVIII, pp. 9–18, (1938).

The author urges the necessity of publishing the individual anthropometric measurements taken by various investigators on Indian tribes. He believes that the analysis of the racial composition of the population of the United Provinces and the Punjab will throw new light on the ancient cultures of India, and refers to the anthropological investigations of the provinces recently undertaken by the Lucknow University.

B. K. C.

494. **Misso, Clifford** and **Sandrasagra, A. P.**—A Survey of Anatomical Abnormalities occurring in the Dissecting Room of the Ceylon Medical College. *Ceylon Journ. Sci.*, IV, Sec. D, pp. 196–224, (1938).

The authors summarise the results of their studies of anatomical abnormalities on a number of Singhalese, Tamil, Malayali and Vedda Cadavars with particular reference to their locomotor and vascular system and Splanchnology. B. K. C.

495. MONDAL, R. K. and BASU, M. N.—Colour preferences of the Santals. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 205, (1938).

496. RAO, R. KRISHNA and AYER, A. ANANTHANARAYANA—Interparietal bone in man. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 201, (1938).

497. RAY CHOUDHURY, T. C.—The Radhiya and Varendra Brahmins of Bengal. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 197, (1938).

498. RAY CHOUDHURY, T. C. and BASU, R. N.—The development of the head among the Bengalis. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 204, (1938).

499. ROY, C. R.—The racial affinity between the Brahuis and the Dravidians. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 202, (1938).

500. SARKAR, S. S.—Preliminary Note on the Blood groups of the aborigines of Bihar. *Current Science*, VI, p. 283, (1938).

In this short note the author summarises the results of his blood group investigations on 139 Hill Mālér, 199 Santals, 35 Oraons and 44 Bagdis. B. K. C.

501. SARKAR, S. S.—A proposed classification of the Nasal Elevation Index. *Journ. Ind. Anth. Inst.*, I, pp. 63–68, (1938).

The author has stressed the importance of the measurement of nasal depth and the index known as the nasal elevation index. After giving values of this measurement and the index of all the available Indian peoples he has proposed a classification for this index. H. K. B.

502. SARKAR, S. S.—Blood Grouping Investigations in India, with special reference to Santal Perganas, Bihar. *Trans. Bose Res. Inst.*, XII, pp. 89–101, (1938).

The author has grouped serologically 339 Santals, 235 Mālér and 288 individuals of other tribes and castes from the Santal Perganas, Bihar, along with 80 Bagdis from South Bengal. Geographical distribution of the four different blood groups is plotted; a summary of the author's views on Indian blood group relationships after a consideration of all the available data is appended. H. K. B.

503. SARKAR, S. S.—The racial affinities of the Santals. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 202, (1938).

SOCIAL INSTITUTIONS.

504. ACHARYA, P. K.—The system of land-tenure in Ancient India. *Allahabad Univ. Studies*, XIV, pp. 221–229, (1938).

The author discusses the system of land-grants in India from the time of the Mahābhārata down to the recent historical period. A. K. M.

505. **Altekar, A. S.**—The History of the Widow's Right of Inheritance. *Journ. Bihar and Orissa Res. Soc.*, XXIV, pp. 4–28, (1938).

The author discusses the inheritance of husband's property by widows from the Vedic period down to the present day. This article forms a portion of a chapter in the author's forthcoming book on 'The position of women in the Hindu community'. A. K. M.

506. **Ayyath, K. M.**—Family dissolution in Malabar. *Modern Review*, LXIII, pp. 421–428, (1938).

The author discusses the characteristic features of the Matriarchal Joint Family of Malabar, and points out the baneful effects of the blind imitation of Western ideas. He concludes that even though it is late, an attempt should be made to undo the wrong done because the maintenance or dissolution of the matriarchal family is plainly a matter of life and death to the matriarchal communities of Malabar. A. K. M.

507. **Bonnerjea, Biren**—Origin of Caste: A Rejoinder. *Man in India*, XVIII, pp. 285–288, (1938).

The author in this note replies to the criticisms put forward against his theory of the origin of the caste system published in the *Indian Antiquary* (LX). A. K. M.

508. **Bose, J. K.**—Woangala Festival of the Garos. *Man in India*, XVIII, pp. 168–173, (1938).

The author describes in detail the Woangala festival of the Garos which is usually held just after the gathering of the harvest. A. K. M.

509. **Bose, J. K.**—Ordeals among the Garos. *Man in India*, XVIII, pp. 174–176, (1938).

Of the many ordeals prevalent in Garo society the author selects four and describes them in detail. A. K. M.

510. **Bose, J. K.**—Tri-clan and marriage-classes in Assam. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 200, (1938).

511. **Cutting, C. Suydam**—'Forbidden' Lhasa revealed: A city of parks and picnic parties. *Ill. Lond. News*, 192, pp. 430–433, (1938).

A short account of many of the curious customs of the Tibetans are given in this article with illustrations. A. K. M.

512. **Das, T. C.**—Clan-monopoly of personal names among the Purum Kukis. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 198, (1938).

513. **Datta Mazumdar, N.**—The marriage and *nishpat* customs of the Rishis. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 205, (1938).

514. **Dharma, P. C. (Miss)**—Occupations and Professions as seen in the Rāmāyana. *Annals Bhandarkar Orient. Res. Inst.*, XIX, pp. 127–146, (1938).

515. **Dharma, P. C. (Miss)**—Women during the Rāmāyana Period. *Journ. Ind. Hist.*, XVII, pp. 1–28, (1938).

A study of the educational system, marriage customs and rights of women in the Rāmāyana period has led the author to conclude that polyandry was absent but the purdah system was in vogue during that period. A. K. M.

516. **Dikshitar, V. R. R.**—Paternal 'Despotism' in Ancient India. *Journ. Bihar and Orissa Res. Soc.*, XXIV, pp. 112–117, (1938).

In this note the author discusses the ancient Indian conception of the king's duty towards his subjects based on ancient Sanskrit texts. A. K. M.

517. **Dikshitar, V. R. Ramchandra**—South Indian Customs in the Smṛtes. *Indian Culture*, V, pp. 1–7, (1938).

The author illustrates some of the South Indian customs and remarks that the charge, which is sometimes levelled against the Hindus for the non-elasticity of their laws, is based on unreasonable grounds. The ancient legislatures showed their willingness to adjust and frame laws according to the traditions of a family or of a certain territorial unit. A. K. M.

518. **Emeneau, M. B.**—An echo-word motif in Dravidian folk-tales. *Journ. American Orient. Soc.*, 58, pp. 553–570, (1938).

This paper, while it presents four stories and analyses two main types of development, is in effect a plea for the collection in the Dravidian speaking area of other versions of the same motif, so that the types may be established on a firm basis and their distribution mapped out. This alone will enable the reconstruction of the historical spread of the motif in its several types. B. K. C.

519. **Emeneau, M. B.**—Toda Culture thirty-five years after: an acculturation study. *Annals Bhandarkar Orient. Res. Inst.*, XIX, pp. 101–121, (1938).

In this article the author attempts to assess the extent and nature of changes in the Culture of the Todas during the last thirty-five years. A. K. M.

520. **Emeneau, M. B.**—Kinship and marriage among the Coorgs. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 123–147, (1938).

The author studied the kinship and marriage systems of the Coorgs and concludes that the Coorgs were an endogamous community with kinship organisation taking the form of exogamous father sibs. Cross-cousin marriage (both real and classificatory) was said to be the most favoured form of marriage. Kinship terms are applied to many more people than actual blood relations. A. K. M.

521. **Emeneau, M. B.**—Personal names of the Todas. *Amer. Anthropol.*, XL, pp. 205–223, (1938).

The author discusses the personal names of the Todas and is of the opinion that men's names are, in the majority of cases, sib names, while the women's names, on the contrary, have nothing to do with sibs. A. K. M.

522. **Fürer-Haimendorf, Christoph Von**—The last head-hunting feast of the Konyak Nagas of Assam. *Ill. Lond. News*, 192, pp. 208–211, (1938).

One of the primitive rituals of the head-hunting Konyak Nagas of the Assam-Burma border has been described with illustrations. A. K. M.

523. **Fürer-Haimendorf, Christoph Von**—The Morung system of the Konyak Nagas, Assam. *Journ. Roy. Anthrop. Inst.*, LXVIII, pp. 349–378, (1938).

The author describes in detail the Morung system of the Konyak Nagas of Assam with special reference to the rights and duties of the members and the ceremonies associated with the institution. A. K. M.

524. **Ghosh, J. C.**—Caste of the Satavāhanas and Iksvākus. *Indian Culture*, V, pp. 17–24, (1938).

The author discusses the two views of Profs. Ray Chaudhuri and Bhandarkar and concludes that the Satavāhanas were possibly Nāga Brāhmanas without *gotra* and the Iksvāku Kings of South India were the Brāhmana descendants of the Iksvākus.

A. K. M.

525. **Gupta, Jogendranath**—The Santals in Mayurbhunj State. *Calcutta Review*, LXVI, pp. 177–184, (1938).

The author describes the social organisation, marriage, funeral ceremonies, religion and dress of the Santals of the Mayurbhunj State. A. K. M.

526. **Iyer, L. A. Krishna**—Marriage ceremonies of the primitive tribes of Travancore. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 206, (1938).

527. **Mandelbaum, David G.**—Polyandry in Kota Society. *Amer. Anthropol.*, XL, pp. 574–583, (1938).

The author from a study of certain customs of the Kotas of the Nilgiri Hills concludes that they are not polyandrous in the strict sense of the term. A. K. M.

528. **Majumdar, D. N.**—Modern trend in social Anthropology. *Calcutta Review*, LXVI, pp. 162–172, (1938).

After discussing the views of various schools of Anthropology, the author observes that Anthropologists in India and elsewhere have a more important rôle to play in future than that of merely recording folk-tales and folk-customs. Social Anthropology, according to the author, is the science of man and under its developed technique it is bound to throw new light on matters which a practical man has to deal with. A. K. M.

529. **Mehta, Manubhai N.**—The Bhils of the Gwalior State. *Man in India*, XVIII, pp. 264–284, (1938).

The author deals with the racial origin, social and religious life of the Bhils of Gwalior State.

B. K. C.

530. **Mills, J. P.**—A Lhota Naga 'Apotia' death. *Journ. Ind. Anthrop. Inst.*, I, pp. 23–27, (1938).

The author gives a description of an interesting case of the reaction to the 'apotia' death of a Lhota Naga.

B. K. C.

531. **Pantulu, N. K. Venkatesam**—The Vedic Ritual of Marriage. *Quart. Journ. Myth. Soc.*, XXVIII, pp. 144–169, (1938).

This is a critical account of the marriage rituals according to the Vedas.

A. K. M.

532. **Rao, P. B. Ramchandra**—Poligars of Mysore and their Civilisation. *Quart. Journ. Myth. Soc.*, XXIX, pp. 150–162, (1938).

A detailed description of the ancient Poligars inhabiting the mountain regions and jungles of Mysore.

A. K. M.

533. **Roy, Sarat Chandra**—Caste, Race and Religion in India. *Man in India*, XVIII, pp. 85–105, (1938).

This is a continuation of the author's previous papers on the subject published in (*Man in India*, 1937). In this article he deals with the probable contributions of the Alpine and Mongolian racial elements to Indian caste and culture.

B. K. C.

534. **Sen Gupta, N. C.**—Putrika, or the appointed daughter's son in Ancient Law. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 149–165, (1938).

The author revises his former views expressed in one of his papers, *viz.*, 'Early History of the Sonship in India' (*Man*, Art. 32 and 42, 1924) in which he traced the history of evolution of the secondary son in India.

B. K. C.

535. **Sheshappa, B.**—Communities of South Kanara. *Journ. Madras Geog. Assoc.*, XIII, pp. 310–314, (1938).

The author surveys the tribes and castes of South Kanara and discusses the position of each of them in the society.

B. K. C.

536. **Sirkar, D. C.**—A Bengali Custom. *Indian Culture*, V, pp. 333–335, (1938).

In this note the author publishes a list of the names of those relatives which are avoided by both the Hindus and Muhammadans of Bengal and their substitutes.

B. K. C.

537. **Upadhya, Bhagwat Saran**—Social India as depicted by Kalidasa. *Journ. Benares Hindu Univ.*, II, pp. 125–175, and pp. 483–522, (1938).

The author studies the structure of Indian society at the time of Kalidasa, specially dealing with the *Samskaras*, different forms of marriage, position of widows, and the custom of *Sati*, etc.

In the second article the author describes the dresses of men and women, their ornaments, social habits, popular beliefs, superstitions, festivals, etc. from ancient times.

A. K. M.

RELIGION, FOLK-LORE AND MUSIC.

538. **BARUA, K. L.**—Human sacrifice in Assam. *Journn. Assam Res. Soc.*, VI, pp. 4–11, (1938).

The author contradicts the views expressed by Gait in his article on 'Human sacrifices in Ancient Assam' and adds that Gait's interpretation of the facts is vitiated by the fact that it is based only on an erroneous translation of the *Vamsāvali*.
A. K. M.

539. **BASU, M. N.**—Religious life of the Bunos of Bengal. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 203, (1938).

540. **BHATTACHARYA, A. C.**—Folk-tales, Folk-dances, Folk-lores. *Journ. Assam Res. Soc.*, VI, pp. 21, 22, (1938).

The author discusses folk-tales in general and points out the need of their thorough study in India.
A. K. M.

541. **CHAUDHURI, NANIMADHAB**—Rudra—Çiva as an agricultural deity. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 203, (1938).

542. **CHAUDHURI, B. K.**—A preliminary study on the Vṛsa Kāstha of Bengal. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 203, (1938).

543. **COOMARSWAMY, A. K.**—The Inverted Tree. *Quart. Journ. Myth. Soc.*, XXIX, pp. 111–149, (1938).

The author compares 'The Inverted Tree' as described in ancient Sanskrit texts with similar conceptions existing among some of the people.
A. K. M.

544. **DAS GUPTA, C. C.**—Human sacrifice and the Sabarās of Orissa. *Man*, XXXVIII, p. 16, (1938).

The author discusses the probability of the existence of human sacrifice in Orissa from ancient times.
A. K. M.

545. **DIKSHITAR, V. R. RAMCHANDRA**—The Cow in Hindu life. *Journ. Benares Hindu Univ.*, II, pp. 471–481, (1938).

The author describes the varying degree of regard for the cow as exhibited by different sections of Hindu society from Vedic times onwards.
A. K. M.

546. **GANGOOLY, O. C.**—Non-Aryan contribution to Indian Music. *Annals Bhandarkar Orient. Res. Inst.*, XIX, pp. 263–272, (1938).

After discussing the music of some of the Indian tribes the author concludes that the Aryan music known to-day is indebted to some extent to the contributions of Non-Aryan or aboriginal tribes.
A. K. M.

547. **FEIGE, THEODOR**—Mysterious statues found in a Borneo Cave: Relics of Hinduism. *Ill. Lond. News*, 192, pp. 660, 661, (1938).

A short description is given along with illustrations of an old Hindu Sanctuary in Borneo wherefrom a set of stone figures of Hindu deities such as Ganesa, Kartikeya, etc. were found.
A. K. M.

548. **Gorer, Geoffrey**—Sacrifice to the Gods of Kanchenjunga: Curious rites of the Lepchas, combined with Tibetan Lamaism. *Ill. Lond. News*, 193, pp. 270, 271, (1938).

Short descriptions of the Lepchas with illustrations from the author's book 'Himalayan Village' are given in this article. A. K. M.

549. **Lalou, Marcelle**—Le culte des Naga et la Thérapeutique. *Journ. Asiatique*, CCXXX, pp. 1–19, (1938).

The author cites numerous texts of Buddhistic canons in the Tibetan language on serpent worship and its effects. A. K. M.

550. **Mitra, P. K.**—A Mundā Folk-tale. *Man in India*, XVIII, pp. 153–162, (1938).

The author describes an interesting Mundā folk-tale with its English translation. A. K. M.

551. **Mitra, Kalipada**—The New Year Festivals. *Man in India*, XVIII, pp. 106–121, (1938).

The author opines that most of the festivals are associated with the beginning of the new year and with the help of Sanskrit texts endeavours to show when the new year used to commence in ancient times. A. K. M.

552. **Mitra, Sarat Chandra**—Notes on the three quaint Indian superstitions. *Quart. Journ. Myth. Soc.*, XXVIII, pp. 209–214, (1938).

The author describes (1) the supposed exudation of blood from stones, (2) the supposed eruption of smallpox on stones, and (3) the supposed rain of blood. A. K. M.

553. **Mitra, Sarat Chandra**—Studies in Bird-Myths. *Quart. Journ. Myth. Soc.*, XXVIII, pp. 312, 313, (1938).

The author directs attention to the occurrence of similar traditions among the Ao Nāgās, Santāls, Thādo-Kukis and the Lepchās of Sikkim. B. K. C.

554. **Mitra, Sarat Chandra**—On an Ancient Indian Charm for Exorcising away Noxious Animals from Paddy-Fields. *Quart. Journ. Myth. Soc.*, XXIX, pp. 72–76, (1938).

The author describes an ancient Indian charm extensively prevalent in Bengal at the present day for exorcising away noxious animals and insect pests from the fields of paddy crops. B. K. C.

555. **Mitra, Sarat Chandra**—On the cult of the godling Bīr Kuār in Palamau District in Chota Nagpur. *Journ. Bihar and Orissa Res. Soc*, XXIV, pp. 58–69, (1938).

The author describes the worship of the godling named Bīr Kuār as practised by the Bhuiyās, Āhirs, etc. to protect their cattle from the depredations of tigers and diseases. A. K. M.

556. MOSES, S. T.—Water-Divining. *Quart. Journ. Myth. Soc.*, XXIX, pp. 24–28, (1938).

The author traces the origin of the Water Divining process which was prevalent even in ancient times.
A. K. M.

557. NATH, R. M.—The worship of the jackal and dog in India. *Journ. Assam Res. Soc.*, VI, pp. 27-29, (1938).

558. PANDEY, R. B.—The purpose of the Hindu *Saṁskāras*. *Journ. Benares Hindu Univ.*, II, pp. 281-292, (1938).

The author has attempted to investigate the real purpose and significance of the ancient institution of the Hindus, *viz.*, the *Saṁskāras*.
B. K. C.

559. PANDEY, R. B.—The Constituents of the Hindu *Saṁskāras*. *Journ. Benares Hindu Univ.*, II, pp. 457–469, (1938).

The author studies the constituents of the Hindu *Saṁskāras* and is of opinion that the *Saṁskāras* are a complex combination of various elements. They express beliefs, sentiments and knowledge of the ancient Hindus about the nature of human life and the Universe, and their relation with superhuman powers that were supposed to guide or control the destiny of man.
A. K. M.

560. ROY, DAVID—The significance of Cowrie shells in Khasi ceremonies. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 194, (1938).

561. SATYARATHI, DEVENDRA—Habli folk-songs come nearer. *Modern Review*, LXIV, pp. 53–66, (1938).

The author publishes translations of some of the beautiful Habli songs of the Baster State.
B. K. C.

562. SEN GUPTA, N. N.—Dancing as a method of inducing ec tasy and frenzy. *Proc. Twenty-fifth Ind. Sci. Cong.*, Calcutta, Abstract, p. 200, (1938).

PRIMITIVE LINGUISTICS.

563. AMBLER, G. M.—A Vocabulary of the Mawkhen Salon or Sea-Gypsy Language of the Mergui Archipelago. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 195-281, (1938).

564. BOR, N. L.—Yano-Dafla Grammar and Vocabulary. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 217–281, (1938).

565. BOR, N. L. and PAWSEY, C. R.—English-Sema Vocabulary. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 309–349, (1938).

This is an up-to-date list of the Sema-Naga Vocabulary, based on a study of the grammar and list of vocabulary published by Dr. Hutton.
A. K. M.

566. VARMA, SIDDHESHWAR—The Dialects of the Khasāli Group. *Journ. Roy. As. Soc. Bengal, Lett.*, IV, pp. 1–65, (1938).

The author studies the general characteristics of the Khasāli dialects which he considers to be a sub-dialect of *Bhadarwāhi* spoken by the inhabitants of the Raggi Valley.
A. K. M.

IX. PHYSIOLOGY

(including Animal Physiology, Pathology, Bacteriology, Psychology and other Medical and Veterinary subjects).

MISCELLANEOUS.

1. **Basu, S. K.** and **Basu, S.**—A contribution to the study of diaphysio-epiphysial relations at the elbow of young Bengalee girls. *Ind. Jour. Pediat.*, V, pp. 201–204, (1938).

A rontgenographic study of the time of epiphysial union of 203 middle class Bengalee girls from birth to twenty years of age has been made. The results show a good deal of difference from similar figures arrived at by western workers. But the difference is less when compared with figures obtained on a heterogenous Indian populations by Hepworth, Galstaun and Barret. A comparative table of the inception and completion of ossification of epiphysial centres is given at the end of the article.

M. A.

2. **Basu, S. K.** and **Basu, S.**—The age-order of epiphysial union in Bengalee girls. *Jour. Ind. Med. Association*, VII, pp. 571–578, (1938).

Epiphysial union of 130 Bengalee girls, ranging from 3 to 19 years drawn chiefly from the middle class, was studied with the help of skiagraphy. Considerable discrepancy was found to exist between results arrived at by the present authors and those in the European countries. The study, however, definitely indicated that the epiphysial union in Bengalee girls occurred earlier than girls of other countries.

N. D.

3. **Khan, H.**—Ovulation in fish. Effect of administration of extract of anterior lobe of pituitary gland. *Current Science*, VII, pp. 233–234, (1938).

The Indian carp (*Cirrhina mrigala*) kept in aquaria ovulated within 96 hours of being injected with 40 rat units of anterior pituitary extract. Ovulation under natural conditions is probably the result of anterior pituitary secretion stimulated by environmental factors.

H. K.

CLINICAL MEDICINE AND EXPERIMENTAL THERAPEUTICS.

4. **Bhaduri, B. N.** and **Biswas, C. K.**—The effect of dark adaptation on the tension of eyes in patients suffering from Epidemic Dropsy. *Calcutta Med. Journ.*, XXXIV, pp. 206–214, (1938).

The authors have observed the influence of dark adaptation on the variation of intra-ocular tension in Epidemic Dropsy patients with normal individuals as controls. In a few cases there was no loss of tension, whereas the majority of cases showed a rise of tension varying within a wide range. Further work is in progress.

M. A.

5. **Chakravarty, J.**—Eclampsia in Bengal, *Calcutta Med. Journ.*, XXXIV, pp. 385–397, (1938).

The author has presented the records of 500 cases of Eclampsia, which were admitted into some of the main hospitals of Calcutta during a period of 12 years (1925 to 1937). The factors that may influence the incidence of Eclampsia are discussed. Maternal mortality and foetal mortality in relation to the incidence of eclampsia have been graphically shown. The aetiological factors of age, blood pressure, racial incidence, period of pregnancy, parity, number of fits, presence of albumen in urine, etc., have been statistically analysed. The relationship of the number of fits to incidence of eclampsia and maternal mortality has been graphically shown. The seasonal variations of eclampsia and the effects of diet upon the condition have also been discussed. The principles of prophylactic and curative treatment are outlined. B. M.

6. CHATTERJEE, H. N.—Some clinical aspects of Anaemia of pregnancy in Indian women living in Bengal. *Ind. Med. Gaz.*, LXXIII, pp. 267–271, (1938).

The author has discussed various clinical aspects of anaemia of pregnancy in Bengalee women. The factors of age incidence, race and caste distribution, parity, seasonal variation and oedema have been graphically represented. H. N. C.

7. CHOPRA, R. N. and CHOPRA, G. S.—Present position of the Opium smoking habit in India. *Ind. Med. Gaz.*, LXXIII, pp. 193–203, (1938).

The authors have studied the physical and mental effects produced by opium smoking and have discussed the social, racial and environmental factors connected with this evil habit. Circumstances responsible for opium smoking in a series of 300 cases have been statistically analysed. The effects of the opium habit on different parts of the system as well as on sexual impulse have been discussed in detail. B. M.

8. CHOPRA, R. N. and DAS GUPTA, B. M.—A note on therapeutic efficiency of soluseptasine in simian malaria (*P. knowlesi*). *Ind. Med. Gaz.*, LXXIII, pp. 395-396, (1938).

A monkey weighing 4·48 kilogrammes was inoculated with 3 c.c. of monkey blood showing a very scanty infection with *P. knowlesi*. After a few days when parasite count in the infected monkey was very high (nearly 40 p.c. red blood cells infected), the monkey developed haemoglobinuria and looked very ill. Intravenous injection of 2 c.c. soluseptasine was given and the blood examination revealed a fall in the parasite count and definite degenerative changes in the parasites. No parasite could be found when the same dose was repeated intramuscularly after 24 hours following the initial dose. The parasites reappeared after 12 days in small numbers and eventually disappeared altogether without any treatment. This showed that sulphonamide compounds are effective specific drugs for malaria. N. D.

9. CHOWDHURI, K. C.—Choreiform type of cerebral Syphilis. *Ind. Jour. Pediat.*, V, pp. 105–107, (1938).

Cerebral syphilis has been considered by the author to have some aetiologic relationship with chorea. One case of choreiform type of cerebral syphilis has been discussed. M. A.

10. DE, B.—Observations on two hundred cases of Pregnancy with Leucorrhoea. *Calcutta Med. Journ.*, XXXIV, pp. 114–117, (1938).

The author has studied 200 cases of Leucorrhoea during pregnancy in the antenatal clinic of a Calcutta hospital. These cases have been followed up to the 10th day of the puerperium and from the rather high incidence of puerperal complications, it has been concluded that excessive white discharge per vaginum in pregnancy is a constant source of danger during the puerperium. Local application of 10% aqueous solution of mercurochrome has alleviated the condition and reduced the puerperal morbidity rate. The author considers that neglect of this condition during pregnancy is responsible for many cases of puerperal infection and its sequelae. N. D.

11. **De, M. N.** and **Seal, S. C.**—Can Malaria cause peripheral nerve palsy? *Ind. Jour. Pediat.*, V, pp. 9–12, (1938).

The biological peculiarities of *Plasmodium falciparum* have been discussed. In this type of infection, though the involvement of the cerebrospinal system is common, individual nerves are rarely found to be affected. A case has been described in which the facial nerve of the right side was involved along with the general nervous system. The pathogenesis of such a condition has been fully discussed.

N. D.

12. **Dhunjibhoy, J. E.**—Treatment of Schizophrenia by inducing epileptiform shocks by the drug Cardiazol. *Ind. Med. Gaz.*, LXXIII, pp. 321–325, (1938).

The problem of Schizophrenia with its empirical treatment is discussed. The result of treatment of forty-two cases of Schizophrenia with Cardiazol after the method of Dr. Medurna is encouraging. This method of treatment appears to be perfectly safe in selected cases, specially in the katatonic and hebephrenic types of cases. Unlike insulin therapy, this method is free from any dangerous complication and does not require any constant medical and nursing attention.

N. D.

13. **Ghosh, J., Roy, B.** and **Mukherji, S.**—Analysis of gastric contents of the healthy Bengalee males. *Calcutta Med. Journ.*, XXXIII, pp. 45–52, (1938).

Healthy non-dyspeptic volunteers, mostly medical students, were selected for the analysis of gastric contents of Bengalee males. Results obtained by the alcohol method are very similar to those obtained by the oatmeal gruel method. The alcohol method is adopted for reasons of ease of administration and ease of analysis. No conclusions are being drawn about the caffeine method as the number of cases investigated are too small.

R. C. G.

14. **Lal, R. B.**—Further studies in Epidemic Dropsy. *Calcutta Med. Journ.*, XXXIV, pp. 169–182, (1938).

The author has discussed the aetiology of epidemic dropsy on the basis of the investigations carried out during outbreaks of the disease in different parts of Bengal and Chota Nagpore. In all cases, mustard oil has been found to be the most likely causative agent. All brands of mustard oil, however, could not be incriminated. The poisonous principle is apparently contained only in certain batches of oil milled at a particular period in the localities concerned. The nature of the poison is not known.

B. M.

15. **Lal, R. B., Ahmad, B.** and **Roy, S. C.**—Allylisothiocyanate as an aetiological factor in Epidemic Dropsy. *Ind. Journ. Med. Res.*, XXVI (1), pp. 213–228, (1938).

In a previous communication strong evidence has been presented to show that a deleterious substance of unknown nature and origin contained in certain consignments of mustard oil is the causal agent of epidemic dropsy. The probable rôle of allylisothiocyanate, which forms about 98 p.c. of the total essential oil content of the mustard seed, has been studied from three aspects, and it has been found that—

(1) Nearly 90 p.c. of the allylisothiocyanate content of mustard oil is lost during the process of cooking. When added artificially the loss is still greater.
(2) Rats, cats and monkeys have not been found susceptible to large doses of allylisothiocyanate mixed with mustard oil.
(3) Human subjects may take food cooked in oil containing a total of 2,517 mgms. of the substance during a period of 30 days without suffering from any ill effects. Mustard oil, having a higher allylisothiocyanate content than the one successfully used in human experiments, has been consumed for 2–4 weeks with impunity by several families.

The suggestion is that the poisonous substance in the oil, which is capable of producing symptoms of epidemic dropsy, is not allylisothiocyanate.

R. B. L., B. A. & S. C. R.

16. **Mangalik, V. S. and Stott, H.**—The incidence of Rheumatic Infection in India. *Ind. Med. Gaz.*, LXXIII, pp. 203–207, (1938).

The authors have tried to throw light on some of the problems connected with rheumatic infection among Indians. They are of opinion that acute rheumatic infection in India with polysynovitis, carditis and chorea, though rare in the hospital-going class of Indians, is a definite clinical entility to be seen in independent medical practice. The incidence of chronic rheumatism is far more common.

B. M.

17. **Manohar, K. D. and Khosrawy, K. K.**—Anginal pain in a case of Malaria. *Ind. Med. Gaz.*, LXXIII, pp. 151–153, (1938).

A case of anginal pain in a malaria patient with low blood pressure, rapid pulse and cyanosis has been described by the authors. There was no evidence of thrombosis in other organs of the body and the infection also was not heavy.

N. D.

18. **Maplestone, P. A. and Ghosh, L. M.**—Herpes Zoster. *Ind. Med. Gaz.*, LXXIII, pp. 212-213, (1938).

The authors have treated 40 cases of Herpes Zoster with intradermal injections of tissue lysate prepared from the herpetic vesicles and the results have been uniformly successful in relieving the associated pain and in cutting down the duration of the disease. A simple method of preparing the tissue lysate has been described.

B. M.

19. **Mitra, S.**—Ten year end-results of Carcinoma Cervix with Radiation therapy. *Calcutta Med. Journ.*, XXXIV, pp. 493–502, (1938).

The treatment of Cancer Cervix with radiation therapy has been discussed. Cancer may affect individuals at any age-period. Early detection of cases is very essential. Treatment with radium in proper doses and in early cases is successful.

B. M.

20. **Mitra, S. and Ghosh, T. K.**—Incidence of Eclampsia in relation to meteorological factors in Calcutta. *Calcutta Med. Journ.*, XXXIV, pp. 285–290, (1938).

The authors have analysed the meteorological factors in relation to the incidence of eclampsia in Calcutta for eleven years. The factors pertaining to temperature, rainfall and humidity have been carefully discussed. It has been found that seasonal influence has got some definite relationship with the incidence of eclampsia. The statistical analysis of all the available data show that there is a certain amount of correlation between the maximum temperature and the high incidence of eclampsia.

B. M.

21. **Nair, V. G.**—Prontosil album (sulphanilamide) in the treatment of gonococcal infections. *Journ. Ind. Med. Association*, VII, pp. 393–401, (1938).

A series of twenty-seven cases of gonorrhoea, acute as well as chronic including complications, were treated with 'prontosil album' with success in twenty-five cases. The average dose administered was 15 to 18 g. The results were uniformly favourable in chronic cases which required smaller doses but in acute cases a small percentage of failures occurred, about 4 p.c. in the series. Toxic effects of the drug noticed were few and of a minor nature.

N. D.

22. **Napier, L. E., Choudhuri, R. N. and Raichowdhuri, M. N.**—Gastric Acidity in health and disease in India. *Ind. Med. Gaz.*, LXXIII, pp. 65–73, (1938).

Fractional gastric analyses with alcohol as the test meal have been carried out by the authors on 209 patients of various classes under well-controlled conditions. In the series studied, Europeans showed the highest mean acidity and the highest incidence of hyperchlorhydria, Bengalees came next in order, and the lowest acidity was seen in other Indians, most of whom were Punjabis. The latter group showed by far the largest percentage of vegetarians who were all rice-eaters. This finding tends to support the belief that rice-eating South Indians are notoriously liable to peptic ulceration whereas the wheat-eating Punjabis are much less prone to the disease. However, this does not explain the high incidence in the meat-eating Europeans. As most of the subjects in the European group were drawn from well-to-do classes, it was not improbable that the incidence of hyperchlorhydria in this class was a sequel to alcoholic and dietary indiscretions and accompanying gastritis. Achlorhydria was not common in non-anaemic persons in India. Hyperchlorhydria was observed more in males and achlorhydria more in females. Hyper-acidity also was found more commonly in the higher age groups.

B. M.

23. Palit, C. C. and Basu, S. N.—New idea in the treatment of Epidemic Dropsy. *Journ. Ind. Med. Association*, VII, pp. 197–206, (1938).

A preventive side of the disease consists of taking sufficient quantities of iron—specially in colloidal form—copper, manganese, calcium, phosphorus, vitamins and chlorophyll in the form of green leafy vegetables, fruits and milk. The importance of sunlight and ultraviolet light, in activating the cells of the body and thus producing increased oxidation of the food materials, has been stressed as an adjuvant to the other therapeutic measures. Adulterated or badly stored mustard oil has been found to contain a high percentage of hydrocyanic acid and this might be the deleterious substance present in the oil.

B. M.

24. Rao, M. N.—Peptic ulcer in Northern Circar. *Ind. Med. Gaz.*, LXXIII, pp. 454 to 457, (1938).

Statistics from the hospitals and post-mortem records of the Vizagapatam Medical College Hospitals show that peptic ulcer is a fairly common disease in the Northern Circar. The probable causes for such common incidence are outlined as (1) irregularity in the intervals between meals and the variety of food, predisposing to dyspepsia and frequent pylorospasm, (2) partial avitaminosis giving rise to changes in the gastro-intestinal tract, and (3) teeth and gastro-intestinal tract acting as septic foci leading to selective localisation of the organisms either in the stomach or duodenum.

B. M.

25. Ray, P. N.—Some unusual joint lesions. *Ind. Med. Gaz.*, LXXIII, pp. 10–14, (1938).

The author has discussed some unusual cases of joint diseases. The surgical pathology associated with the internal derangement of the knee, shoulder and wrist joints has been given. A case of Coxa Vulga and a case of Charcot's disease of the hand have also been described.

B. M.

26. Sen, B. B.—On the possibility of treating typhoid fever by veno-typhophage. *Journ. Ind. Med. Association*, VII, pp. 207–712, (1938).

Treatment of typhoid cases with intravenous administration of phage in all stages of the disease and in the later stage in conjunction with oral phage has been advocated. To start with, injection of veno-typhophage ½ c.c. twice intravenously on the first day followed by 1 c.c. morning and evening on the second day may be given. On the third day the injection is repeated using 2 c.c. of the phage for each time. Usually 2 c.c. is sufficient to raise the temperature by 2°F. and this is regarded as the reactionary dose. To find out the reactionary dose of *veno-typhophage* for a particular patient, the injection of half the reactionary dose twice daily is to be continued for three successive days. The results are encouraging in a number of cases.

N. D.

27. Tribedi, B. P. and De, M. N.—Observations on the dysenteric conditions among Europeans of Calcutta. *Brit. Med. Journ.*, I, p. 1000, (1938).

Analyses of 1,370 specimens of stools from Europeans resident in Calcutta are reported. The incidence of dysenteric conditions—amoebic and bacillary—is noted. The possible sources of infection are discussed. Although among the Indian population there is a definite seasonal correlation with the disease, this was not found to be so in the case of the Calcutta Europeans. The association of Charcot-leyden crystals with amoebiasis could not be found to extend far in this investigation. Its presence therefore should not necessarily be identified with amoebiasis.

R. G.

STATISTICS AND EPIDEMIOLOGY.

28. BASAK, K. C.—Infant mortality in British India. *Ind. Jour. Pediat.*, V, pp. 145–159, (1938).

The infant mortality of British India has been statistically analysed. During the period 1926–35, no decline in infant mortality has been observed in India. Different parts of India exhibit heterogeneity in regard to their infant mortality experience. In India, although infant mortality is not declining as a whole, neonatal mortality shows some tendency to decline within recent years.

M. A.

29. IYENGAR, M. O. T.—Studies on the Epidemiology of Filariasis in Travancore. *Ind. Med. Res. Memoirs*, No. 30, pp. 1–163, 24 figs., 12 plates, (July, 1938).

An intensive study of the distribution and incidence of filariasis and the factors that control filarial endemicity was made in Travancore. The distribution of filarial disease in Travancore corresponds closely with that of filarial infection.

Two types of filarial infection occur in Travancore, namely, *Wuchereria bancrofti* (Cobb.) and *Filaria malayi* Brug. Both infections are associated with pathological changes in man, but cases of genital affections were rare in areas with *Filaria malayi* infection while such cases were frequently observed in areas with *W. bancrofti* infection.

The distribution of *Filaria malayi* infection was much more extensive than that of *W. bancrofti*, from the point of view of area as well as that of the population affected. It occurs extensively in the flat alluvial tract along the sea coast and bordering on the back water; its distribution in other parts of Travancore is discontinuous and consists of isolated foci here and there in the undulating areas in the interior. *F. malayi* infection has been observed in many of the settlements of forest tribes in the interior of forests. These tribes, which have very little contact with the outside world, are perhaps the original reservoirs of *F. malayi* infection in Travancore.

F. malayi infection is characteristically rural in distribution in contrast with *W. bancrofti* which is urban in distribution. The infection is transmitted chiefly by mosquitoes of the subgenus *Mansonioides*. *M. annulifera* appeared to be the most important carrier as it showed a high incidence of infection in nature (26·9 per cent in Shertalai Taluk) and was also the most predominant of the three species of *Mansonioides* observed in Travancore. *M. uniformis* and *M. indiana* appeared to be of secondary importance as vectors. Other species of mosquitoes were not of any importance as transmitters of the infection. *Culex fatigans* was definitely refractory to *F. malayi* infection even under experimental conditions.

Facilities offered for *Mansonioides* breeding would determine the incidence of *F. malayi* infection. Flat areas with a large number of ponds showed higher *F. malayi* infection rates than undulating areas with few ponds. The presence of the floating water weed, *Pistia stratiotes*, is an essential factor for *Mansonioides* breeding. The mosquito lays eggs only on the leaves of *Pistia*; the larva is adapted to obtain its supply of oxygen from air cavities in the root of *Pistia*, and it does not survive in the absence of *Pistia*. Factors such as flooding or saline tides, which have an injurious effect on *Pistia*, would reduce the incidence of *Mansonioides* and consequently the *F. malayi* infection rate of the locality would be low. Besides the presence of *Pistia*, organic contamination of the pond water is necessary for *Mansonioides* larvae; this factor provides the food of the larvae and in its absence the mosquito fails to breed.

Filaria malayi infection can be controlled by preventing the breeding of the principal transmitter of the infection, namely *Mansonioides*. This method of 'species sanitation' was carried out at Shertalai by the biological method of removing the host plant necessary for *Mansonioides* breeding. As a result of the removal of *Pistia* the breeding of *Mansonioides* was entirely controlled, its incidence as adults was reduced to a very large extent and the transmission of *F. malayi* infection was entirely stopped.

W. bancrofti infection is typically urban in distribution. It occurred in a few towns with a dense aggregation of population. The infection is transmitted by *Culex fatigans.* It breeds in sullage and in water heavily contaminated with decaying organic matter, and is generally associated with urban areas. Density of population has a bearing on the incidence of *Culex fatigans* breeding, because the quantity of sullage discharge varies directly as the density. The *W. bancrofti* infection rates showed a positive correlation with density of population in contrast to *F. malayi* infection which showed a negative correlation.

W. bancrofti infection can be controlled by prevention of *Culex fatigans* breeding, either by treating the breeding places with larvicides or by proper methods of drainage and sullage disposal.

The memoir contains detailed information of the infection rates, disease rates and endemicity rates of the different localities studied. It is claimed that the filarial endemicity rate, which is a combination of the two rates—filarial infection rate and the filarial disease rate—is a better measure of filarial incidence of a locality than either of the latter rates taken separately.

There is a definite contrariness between the occurrence of filarial infection and of filarial disease in the individual host; there is, however, a significant positive correlation between the incidence of filarial disease and that of filarial infection in the community. In Trivandrum the coefficient of correlation between the disease rates and infection rates of 24 localities was + 0·856, which is significant. Taking the whole of Travancore the rates of 216 localities showed a significant positive correlation ($r = +0{\cdot}7644$).

The filarial disease rate and the filarial endemicity rate showed progressive rise with increasing age, but the infection rate did not show such a rise except in the first decade of life. The absence of a progressive rise in the infection rate in the later ages is probably due to the disappearance of microfilariae from the blood in the infected persons consequent on the onset of disease.

There is no evidence to show that there is any antagonism between malaria and filarial infection or filarial disease.

M. O. T. I.

30. RAJA, K. C. K. E., SWAROOP, SATYA, BASAK, K. C. and LAL, R. B.—Application of Analysis of Variance to Mortality Rates. *Ind. Journ. Med. Res.*, XXVI (1), pp. 321–327, (1938).

When comparing two or more places with regard to the prevalence of any epidemic disease three factors have to be taken into consideration: (1) the average incidence of the disease in each place during the period for which the comparison is instituted, (2) the seasonal distribution of the disease, and (3) the variation in its incidence from year to year. R. A. Fisher's method of analysis of variance appeared to be a reasonable method of approach, the three variables being place, month and year. There are certain considerations involved in the application of this method, which are set out in the paper. Cholera mortality figures for certain parts of Bengal were used and it was found that Z-test might not be applicable to this type of data. The problem was that of establishing similarity or otherwise between contiguous areas in regard to the prevalence of cholera. A modified procedure, which was suggested by Dr. J. O. Erwin of the London School of Hygiene and Tropical Medicine and which utilises the information afforded by analysis of variance, was adopted for combining adjacent areas into regions of homogenous cholera experience.

K. C. K. E. R.

31. SWAROOP, SATYA—Numerical estimation of *B. Coli* by Dilution Method. *Ind. Journ. Med. Res.*, XXVI (2), pp. 353–378, (1938).

The problem of the estimation of the most probable number of organisms present in a water supply as tested by the inoculation of varying quantities in a liquid medium is discussed. A suitable method for the determination of the standard error attached to the probable number has been worked out and tables have been constructed which could be used to simplify calculation for the determination of the most probable number and the standard error of this number. The relationship between the number of tubes used for any set of dilutions and the accuracy of the probable number is given. The tables for the probable numbers given by the Ministry of Health have been reconstructed so as to give the value of the probable numbers correct to the nearest unit and their standard errors have also been calculated.

S. S.

BACTERIOLOGY, SEROLOGY, IMMUNOLOGY AND VIRUS DISEASE.

32. **BASU, M. N.**—Blood groups of Noluas of Bengal. *Nature*, CXXXI, p. 649, (1938).

100 adult male Noluas showed: group O 16%, group A 38%, group B 33%, group AB 13%.

B. M.

33. **BASU, M. N.**—Blood groups among the Khasis. *Nature*, CXLII, p. 797, (1938).

The distribution found among the Khasis of Khasia and Jaintia Hills, Assam, was AB 4·5%, A 15·6%, O 46·6%.

B. M.

34. **CHAKRAVARTI, S. N.** and **ROY, S. N.**—Experiments on the stability of seminal stains from a medico-legal standpoint. *Ind. Med. Gaz.*, LXXIII, pp. 412–414, (1938).

A series of experiments were instituted which showed that while fluorescence test was given by dry seminal stains even after 100 days, in the case of mixed stains (semen stains containing blood) the fluorescence test was not given after 44 days, although complete spermatozoa could be detected. In the case of wet stains (semen and blood of semen alone moistened with water and kept exposed to the atmosphere in open dishes) fluorescence test was not given after 24 hours but sperm heads were detected after 100 days. It would be justifiable to declare a positive result if a number of good spermatozoal heads are found.

N. D.

35. **GHOSH, H.**—*B. Pyocyaneus* infection simulating cholera and acute dysentery. *Journ. Ind. Med. Association*, VII, pp. 655-656, (1938).

When the stools of several cases suspected to be suffering from cholera were cultured, pure culture of *B. Pyocyaneus* was found to grow. Unlike cholera the stools were found to contain blood. This suggests that *B. Pyocyaneus* may produce symptoms simulating cholera or acute dysentery.

N. D.

36. **GOYAL, R. K.**—A serological study of the actinomyces. *Ind. Journ. Med. Res.*, XXV (4), pp. 843–846, (1938).

The antigenic relationship of actinomyces, corynebacterium and mycobacterium was investigated by the complement-fixation test. Due to the unemulsifiable nature of the actinomyces, a methyl-alcohol extract as advocated by Boquet and Negre was used and the technique of Calmette and Massol was employed. Although a specific antigen was present in certain strains of acid-fast bacilli, yet an antigen common to the actinomyces, corynebacterium and mycobacterium was clearly demonstrable. The organisms far removed from the tubercle bacilli on a microbiological basis did not possess an appreciable amount of the antigen present in the actinomyces-tubercle group. The mammalian tubercle bacilli and actinomyces were found to have only group antigens, the specific antigens were found to be absent in the methylic extracts. The commercial antidiphtheritic serum was found to have very little complement-fixing power for the antigens utilised by the serum prepared with washed diphtheria bacilli which could fix the very same antigens. The specificity of the antigens did not depend on the roughness or smoothness of the colonies.

R. K. G.

37. **GREVAL, S. D. S.**, **DAS, B. C.** and **SEN GUPTA, P. C.**—On Wassermann Reaction. Part III. The Positive Serum. *Ind. Journ. Med. Res.*, XXVI (2), pp. 393–400, (1938).

Wassermann positive sera vary in their power of fixing complement. Certain positive sera (++, method No. 4 of the British Medical Research Committee) will still give a ++ reaction when diluted 1 in 200: others will turn + or ± when diluted 1 in 20 (the usual dilution being 1 in 5). Only some of these ++ sera will fix complement with an

uncholesterinized heart extract: their power of fixing complement with ordinary antigen (cholesterinized heart extract) is of a very high order. It is proposed to designate them + + + sera.

From six pooled + + + sera, passed through Seitz filter, three dilutions are prepared: (i) the highest dilution which will give a + + + reaction with a plain (uncholesterinized) heart extract, (ii) the highest dilution which will give a + ± reaction with the ordinary antigen, and (iii) the highest dilution which will give a ± reaction with the ordinary antigen. These are *titrated controls*. The first control is used in selecting heart extract for the antigen, and the second and third are controls for a day's work. The pooled serum can be preserved easily.

With the titrated controls problems can be solved which would otherwise require a large number of blood tests from known cases and a critical analysis of figures. Incidentally, the controls have shown that while a doubtful reaction can be mistaken for a positive reaction, the reverse error is much less likely.

S. D. S. G.

38. LAHIRI, D. C.—Use of non-specific substances in the production of Tetanus and Diphtheria antitoxin. *Ind. Journ. Med. Res.*, XXVI (1), pp. 311–316, (1938).

For the production of tetanus antitoxin, two groups of horses were used. The first group consisting of horses that were already in the process of hyper-immunisation; and the second group consisting of new horses only. Both the groups were subdivided into three sections each. Horses of section A received antigens (tetanus toxin plain and modified with formalin) with 0·25 to 1·0% alum; those of section B received antigens with 0·5% tapioca powder alternating with 0·25% calcium chloride; and those of section C received antigens alone. Horses of section B of both the groups produced amounts of antitoxin in units per c.c. much greater than that produced by those of the other two sections—though the horses of the second group produced amounts of antitoxin much lesser than that produced by those of the first group. For the production of diphtheria antitoxin, a group of horses were similarly divided into three sections and received antigen (diphtheria toxin modified with formalin) with alum, antigen with tapioca and calcium chloride and antigen alone respectively, using same proportions of those non-specific substances as used for the production of tetanus antitoxin. In this case, horses of section A (that receiving antigen with alum) produced the greatest amounts of antitoxin per c.c.

D. C. L.

39. LAHIRI, D. C.—Studies on the utility of Ramon's flocculation test in the standardisation of Tetanus Antitoxin. *Ind. Journ. Med. Res.*, XXVI (2), pp. 345–352, (1938).

Working with a mixture of freshly prepared tetanus toxin broths and a mixture of tetanus antitoxic horse sera, it was found that neither a series of mixtures with constant antigen and varying proportion of antibody, nor a series with constant antibody and varying proportions of antigen showed any uniformity in the rapidity of flocculation commencing from the mixture showing earliest flocculation and progressing on the sides of antibody and antigen excesses. The ratio of the constant antibody to the constant antigen optimum proportions of the particular system was about 1·8, and the supernatants of the centrifuged flocculated mixtures of the constant antibody and the constant antigen optimum proportions showed clear evidence of the presence of antitoxin, so that those optima did not represent perfectly neutral points. It appeared that on theoretical considerations Ramon's flocculation test was not accurate enough to justify the use of this method in the standardisation of tetanus antitoxin.

D. C. L.

40. LAHIRI, D. C.—Experimental Studies to guide the selection of the most satisfactory type of Anti-Welchii serum for the prevention and treatment of Gas Gangrene in man. *Ind. Journ. Med. Res.*, XXVI (2), pp. 401–410, (1938).

Groups of pigeons were injected with different amounts of an antitoxic and an antibacterial serum prepared in horses and then with a living bacterial suspension one hour after the injection of protective sera. In another set of experiments, the pigeons received injections of living bacterial suspension three days after injections of protective sera. The survival rates in different groups of pigeons showed that antitoxic serum alone can protect

an animal against both an immediate and a delayed experimental infection; and that the protection offered by an antitoxic serum is significantly better than that by an antibacterial serum, when compared volume to volume. In another experiment commercial anti-Welchii sera were titrated against the three different biological effects—haemolytic, necrotic and lethal—of the type A toxin. The result showed that they can neutralise all the effects of the toxin to an equal degree. The problem of the proper selection of the most satisfactory type of anti-gas gangrene serum for use in man is discussed.

D. C. L.

41. **Pandit, C. G., Rao, R. S. and Shortt, H. E.**—Response of the chorio-allantoic membrane of the developing chick embryo to inoculation with various substances with special reference to *B. proteus* ×19. *Ind. Journ. Med. Res.*, XXV (3), pp. 595–602, (1938).

The interpretation of results of inoculation of the chorio-allantoic membrane with material supposed to contain a hypothetical virus which is not readily transmissible to laboratory animals is very difficult. So the response of the chorio-allantoic membrane to substances definitely known not to contain any virus was studied. The substances employed belonged to different categories such as insoluble substances, soluble substances, biological substances and bacteria. It was found that aluminium gel alone of the inert substance and bacteria produced lesions not dissimilar to those met with in known virus infections. The lesions produced by *B. proteus* × 19 and *E. typhosus* were capable of propagation in series after filtration of the ground lesions through gradocal membranes. The nature of the agent producing lesions in series is under investigation. It is suggested that it might be a filtrable form of the organism.

H. E. S.

42. **Rane, L. and Subbarow, Y.**—Nutritional requirements of haemolytic streptococci. I. Effect of various substances isolated from liver extract. *Proc. Soc. Exp. Biol. Med.*, XXXVIII, pp. 837–839, (1938).

A culture medium which contains glutathione, thiochrome, flavin, nicotinic acid, betaine, glucosamine, and a Ca-alcoholic ppt. of liver extract is more favourable to the growth of Dochez NY 5 strain of streptococci than one which lacks any one of these substances.

B. M.

43. **Rao, R. S.**—Cultivation of Sheep-pox Virus on the Chorio-allantoic Membrane of the Chick Embryo. *Ind. Journ. Med. Res.*, XXVI (2), pp. 497–504, (1938).

Sheep-pox virus has been successfully cultivated on the chorio-allantoic membrane of the chick embryo. This cultured virus is definitely modified in character by serial passages in that it becomes infective to rabbits and calves and also fails to generalise in sheep. Immunologically it was found that there was common antigenicity to a limited extent between the cultured sheep-pox virus and vaccinia virus. It was also observed that the cultured virus conferred appreciable immunity in sheep against the natural virus.

R. S. R.

44. **Ray, N. N. and Das, G. C.**—The immunization of horses for the production of high titre tetanus antitoxin. *Ind. Journ. Med. Res.*, XXV (3), pp. 617–621, (1938).

Twenty-nine horses were taken for the production of tetanus antitoxin. They were first immunized with plain antigen and then divided into four groups. The first group was again immunized with higher doses of antigen only. The second group, after a period of 10 days' rest, was immunized with alum and antigen. The third group was treated first with tapioca and antigen and then subdivided into two groups, III*a* and III*b*, which received respectively $CaCl_2$ and antigen, and $MnCl_2$ and antigen. Of these four groups, group III*a* was found to yield sera of very high titre.

B. N. G.

45. **Ray, N. N. and Das, G. C.**—Immunization of horses for the production of high-titre tetanus anti-toxin. *Ind. Journ. Med. Res.*, XXVI (1), pp. 317–320, (1938).

Eighteen horses which received previous injections of tetanus toxin were selected. They were allowed rest for 4 to 5 weeks, before starting this set of experiments. They were divided into two groups. Group II consisting of six horses received injections of toxoid only while group I consisting of 12 horses were first treated with increasing doses of toxoid mixed with powdered tapioca, followed by another series of injections mixed with calcium gluconate (1 per cent). The average titre of horses of group I rose to 1625 I.U. per c.c. while that of the horses of group II rose to 616 I.U. per c.c. only. These results are in agreement with our previous observation. (*Ind. Journ. Med. Res.*, Vol. 25, p. 617, 1938.)

N. N. R.

46. **Sen, Benode Behari**—Studies on Meningococcus Bacteriophage. *Ind. Journ. Med. Res.*, XXVI (2), pp. 335–344, (1938).

Meningococcus Bacteriophage active against a local strain of Meningococcus was accidentally discovered. After repeated daily passages through the locally isolated typical as well as atypical Meningococcus and foreign delicate Meningococcus (Wadsworth) and *Neisseria Flavescens* (Sara Branham) for some time, the phage effected lysis of all these strains. A special liquid medium without serum has been found for effecting uniform growth of delicate as well as easy-growing Meningococcus. This medium consists of heart muscle maceration with bactopeptone 0·2 p.c., sodium chloride 0·5 p.c., dextrose 0·1 p.c., maltose 0·1 p.c., agar-agar 0·01 p.c., with a small bit of coagulated white of egg, with final pH 7·8.

Meningo-phage when kept for one year in contact with serum, *i.e.*, when prepared in media containing serum, does not seem to deteriorate. The action of Meningo-phage is retarded *in vitro* at the temperature of 37°C. or higher. Its thermal death point is 60°C. or higher. After successful results in Meningococcoemia in rabbits, Meningo-phage was tried on hospital patients. Clinical results tend to show that *in vivo* the Meningo-phage can grow and produce its effect when administered intravenously and intrathecally.

B. B. S.

47. **Shortt, H. E., Pandit, S. R., Menon, K. P. and Swaminath, C. S.**—The absence of effective immunity after cure of protozoal infections. *Ind. Journ. Med. Res.*, XXV (3), pp. 763–777, (1938).

Experiments carried out with three different protozoan parasites, *Babesia canis*, *Plasmodium cynomolgi*, and *Plasmodium knowlesi*, appear to indicate that immunity to these parasites is dependent on their continued existence in the host's body.

Parasitic sterilization of the host is followed by susceptibility to infection by the homologous strain of parasite as complete as in a primary infection.

The question as to whether 'after cure' attacks are, on an average, as severe as primary attacks requires further investigation, using larger series of animals.

H. E. S.

48. **Shortt, H. E., Pandit, C. G. and Sanjiva Rao, R.**—The Virus of Sandfly Fever in Culture and certain of its properties. *Ind. Journ. Med. Res.*, XXVI (1), pp. 229–240, (1938).

The culture of the virus of Sandfly Fever on the chorio-allantoic membrane of chick embryos is recorded and a description given of its propagation, for the first time, *in* tissue culture, the technique used in the latter being described. Eighteen passages had been made up to the time of submission of the paper.

The serum of patients, convalescent from Sandfly Fever, was shown to have a neutralising effect on the virus since it prevented the formation of lesions on the chorio-allantoic membrane.

The morphology of the lesions produced on the chorio-allantoic membrane and the result of inoculation of the cultured virus into animals by various routes is described. The size of the virus has been measured and is found to be about 160 $\mu\mu$.

The circulation of the cultured virus in the peripheral blood of inoculated animals has been demonstrated up to at least nine days after intra-peritoneal inoculation. The virus has been successfully transported to England after having been mixed with gum acacia, frozen and dried *in vacuo*,

H. E. S.

49. **Stewart, A. D. and Ghosal, S. C.**—On the value of Wilson and Blair's Bismuth Sulphite Medium in the isolation of *Bact. typhosum* from river water. *Ind. Journ. Med. Res.*, XXV (3), pp. 591–593, (1938).

Using Wilson and Blair's medium, *Bact. typhosum* was isolated 8 times from the water of the River Hooghly at Calcutta out of 78 samples examined. Five samples examined during 'Ardhoday-Yoga' which is a great Hindu festival at which hundreds of thousands of pilgrims take a bath in the river, yielded 3 positives. From this finding the authors suggest that the bacilli present in the water samples were probably derived from human sources and that there is a grave risk in using the river water for bathing, drinking, and domestic purposes.

S. C. G.

50. **Vardon, A. C. and Datta Roy, B. K.**—A Papain-Casein culture medium for the preparation of bacteriophage and for general laboratory use. *Ind. Journ. Med. Res.*, XXVI (2), pp. 379–392, (1938).

Digest 2·5% solution of crude casein (from skim milk) pH 8–8·5 with 0·75 gm. Papain (Ceylon) per 100 c.c. for 2 hours at 70°C. Filter the digest and adjust reaction to pH 7·6. Steam for 30 minutes or autoclave to inactivate the ferment and to deposit phosphates. The pH after this heating remains constant at 7·8–8. Filter, dilute with equal volume of water and add NaCl to 0·5%. Total nitrogen of the medium is 185 mgm. per 100 c.c. consisting chiefly of proteose and peptone nitrogen. This medium contains a smaller amount of free amino-acids than papain-mutton broth; the amount of peptone nitrogen compares favourably with that of 1% Witte's peptone solution. It has been found suitable for the growth of ordinary and delicate organisms and can be used as the basis for preparation of nutrient—agar, blood agar and Loeffler's serum media. This papain-casein medium has proved to be very satisfactory for the preparation of therapeutic cholera-dysentery bacteriophage and for cholera vaccine. Cholera-phage types survive longer in this medium than in 1% Witte's peptone solution or papain-mutton broth. It is the cheapest medium so far prepared in the Pasteur Institute, Shillong and is entirely non-objectionable to the most orthodox in India.

A. C. V.

51. **Veeraraghavan, N. and Philipsz, G. L. C.**—Cultivation of the rabies virus on the chorio-allantoic membrane of the developing egg. *Ind. Journ. Med. Res.*, XXVI (2), pp. 493–496, 1 fig., (1938).

Hens' eggs 12 to 14 days old were inoculated with 0·1 c.c. of varying concentrations of rabies virus, with the object of cultivating the virus on the chorio-allantoic membrane. After incubation for 3 days, the chorio-allantoic membrane was removed aseptically, examined for lesions and then ground up with 5 c.c. of Tyrode solution The suspension of the membrane was tested for infectivity, and used for serial passage in eggs. Out of 67 eggs inoculated with varying concentrations of the Paris strain of Fixed Virus, the membranes of only 3 eggs showed lesions. These consisted of small, discrete opaque foci, which were slightly raised above the surface of the membrane. They were not infective, indicating that they were probably non-specific in character. Lesions of this kind did not appear on subsequent egg passages. None of the membranes inoculated with a virulent strain of Street Virus, which had been passed intracerebrally among fowls, showed any lesions. Ten series of experiments were carried out in an attempt to propagate the virus with negative results in all instances.

N. V. & G. L. C. P.

HAEMATOLOGY.

52. **Choudhury, S. and Mangalik, V. S.**—The anaemias in pregnancy. *Ind. Med. Gaz.*, LXXIII, pp. 257–267, (1938).

A statistical survey of anaemias in pregnancy from the records of a maternity hospital shows that in 2,400 confinements in two years the incidence of anaemia is 5·6 per cent. It is equally common amongst the Hindus and Mohammedans. It is more common in primiparae, and the maximum age incidence is between 20 and 30 years; and there is no seasonal variation in its incidence. The macrocytic hyperchromic type which is identical with tropical macrocytic anaemia is common and in the present series of 47 cases reported,

27 cases (65·8 per cent) are of the macrocytic hyperchromic type. A simple and practical classification of the various types of anaemia has been suggested. This is expected to simplify the treatment with liver extract, vitamin preparation and iron preparations.

R. C. G.

53. DE, M. N. and TRIBEDI, B. P.—Lymphatic Leukaemia in children. *Ind. Journ. Pediat.*, V, pp. 129–135, (1938).

The signs and symptoms of three cases of lymphatic leukaemia in children were discussed. No evidence of infection in the aetiology could be obtained. The morbid histological picture of the lymphatic gland was found to be in general agreement with that described by previous workers.

M. A.

54. MALLIK, S. M. K., SUJAT ALI and SINGH, B.—Myeloid Leukaemia treated by deep X'ray therapy. *Ind. Med. Gaz.*, LXXIII, pp. 19-20, (1938).

Deep X'ray therapy has been tried in cases of myeloid leukaemia with success. The authors consider that the good effect of deep X'ray therapy is due to the stimulation of leucocytic formation and their subsequent maturation and destruction.

B. M.

55. MUKERJEE, M.—Cooley's anaemia (Erythroblastic or Mediterranean Anaemia). *Ind. Journ. Pediat.*, V, pp. 1–7, (1938).

Cooley's anaemia formerly called Erythroblastic or Mediterranean anaemia has been discussed. In this type of anaemia abnormal erythrocytes are produced by the blood-forming organs. The abnormal erythrocytes are found destroyed in the reticuloendothelial system resulting in anaemia and haematogenous jaundice. Hyperplasia of the bone marrow occurs as a reaction, to overcome the anaemic condition, as well as to encounter the hyperplastic marrow, the medullary and diploic spaces of the bones are widened and the certex is thinned out. Radiological examination has been found to be important. Up till now no method of treatment has been of any avail.

M. A.

56. NAPIER, L. E. and MAJUMDAR, D. N.—Haematological Studies in Indians. Part IX. The analysis of haematological findings in 57 cases of anaemia in pregnant tea-garden coolie women, with special reference to the results of treatment. *Ind. Journ. Med. Res.*, XXVI (2), pp. 541–595, 38 figs., (1938).

An examination of blood of 25 males and 25 females showed a low standard of haemoglobin amongst the so-called normal coolies in the population from which the cases are taken. The mean corpuscular volume and the mean corpuscular haemoglobin are also below normal. This is the common characteristic of coolie populations; the significance is discussed.

The cases investigated were provisionally divided into three groups as follows:—

A. Hypochromic.—There are in this group 26 cases: of these 7 are microcytic, 18 are normocytic and 1 macrocytic; of these 26 cases (*a*) 16 (6 microcytic, 9 normocytic, 1 macrocytic) only received iron and responded to the treatment in varying degrees, (*b*) 5 (1 microcytic) had iron only and did not respond, (*c*) 4 had mixed treatment (all normocytic) and responded to the treatment in varying degrees, and (*d*) 1 (normocytic) had mixed treatment and died.

B. Orthochromic.—This group consisted of 28 cases, (*a*) of these 18 (4 macrocytic and 14 normocytic) responded to treatment in varying degrees, (*b*) 7 died (6 normocytic and 1 macrocytic), and (*c*) 2 (both normocytic) did not respond to mixed treatment, and 1 received no treatment.

C. *Hyperchromic.*—The 3 hyperchromic cases were all macrocytic, and all responded to treatment with liver extract. The response to treatment in these cases is discussed in detail and in 34 cases this is demonstrated by groups. According to their response to treatment the cases are arranged into two groups, the iron-responding group and the marmite-liver-responding group which correspond very closely to the hyperchromic group, and the orthochromic and hyperchromic groups, respectively. Certain aetiological, clinical and haematological features in the two groups are contrasted, and the special characteristics of each group summarised.

The aetiological factors in these two types of anaemia are discussed, and the important findings in a dietary survey that was carried out in conjunction with this inquiry are given. The following conclusions were arrived at:—

The population of pregnant tea-garden coolie women as a whole has a low level of haemoglobin associated with a small pale red blood cell: conditioned iron deficiency, brought about by continuous blood loss from hookworm infection in the presence of a low iron intake, will account for this in part, but not, we believe, altogether, and we consider it possible that a low calcium and/or a low vitamin-C intake may be associated factors.

The anaemia amongst pregnant women can be divided into two groups, characteristically microcytic hypochromic and macrocytic hyperchromic, respectively; the former is an exaggeration of the anaemia in the normal population brought about by the extra demands of pregnancy, but the factors concerned in the latter are not quite so evident, though the response to treatment suggests—and a dietary survey does not negative the suggestion—that there is relative deficiency in important food factors probably associated with the vitamin-B_2 complex, and other observations indicate that this deficiency is conditioned by the presence of the foetus with its extra demands for substances essential for haemopoiesis (or less probably its toxic influence) and/or by a state of chronic malaria.

Whilst characteristic examples of each type of anaemia are seen, they seldom occur in 'pure' state and in the vast majority of cases deficiencies of both groups are evident and require rectifying.

L. E. N.

57. NAPIER, L. E. and SEN GUPTA, P. C.—Sternum puncture. *Ind. Med. Gaz.*, LXXIII, pp. 1–6, (1938).

The technique of sternum puncture has been described. The sternum puncture counts of normal individuals have been used as the standards. The various cells found in the normal sinusoid blood of Indians are described and depicted in a coloured plate. A few tables showing the range of variation and the mean number of each different types of cells in the normal sinusoid blood are given. The findings of the authors have been compared with those of Young and Osgood of America and Witts of England.

B. M.

58. NAPIER, L. E., DAS GUPTA, C. R., CHOUDHURI, R. N., RAI CHOUDHURY, M. N., SEN GUPTA, P. C. and MAZUMDER, D. N.—Anahaemin in Tropical Macrocytic anaemias. *Ind. Med. Gaz.*, LXXIII, pp. 385–390, (1938).

In some cases of tropical macrocytic anaemias, anahaemin, marmite, campolon and crude liver extracts were used and it was seen that no one drug singly could effect a cure in all cases. It was also found that while the highly-refined liver extract, anahaemin, containing both the extrinsic and intrinsic factors was very efficient in curing pernicious anaemias, it failed to cure some of the cases of tropical macrocytic anaemia which responded to marmite. This suggests that there must be some curative factor, apart from the extrinsic one, which is lacking in anahaemin but present in marmite or crude liver extract which is responsible for the cure. From the therapeutic standpoint, the aetiology of tropical macrocytic anaemias may be grouped according to their deficiency in pernicious anaemia factor, or in marmite principle, or in some principle which is peculiar to campolon.

H. N. D.

59. RADHAKRISHNA RAO, M. V.—Haematological Investigations in South India. Part IV. Haemoglobin in normal pregnancy. *Ind. Journ. Med. Res.*, XXV (4), pp. 957–970, (1938).

Haemoglobin examinations have been carried out by Bing and Baker's modification of Wu's method on 100 pregnant and 100 non-pregnant women in Coonoor, 6,000 ft. above sea level. The mean haemoglobin values in the pregnant and non-pregnant groups were 15·52 grammes and 15·81 grammes per 100 c.c. of blood respectively.

No correlation was found to exist between haemoglobin and age, parity and duration of pregnancy.

In uncomplicated pregnancy the haemoglobin level is not appreciately below that of the general female population.

M. V. R. R.

60. **Rajan, R. N.** and **Bala Chandran, R.**—Post-Arsphenamine blood Dyscrasias. *Ind. Med. Gaz.*, LXXIII, pp. 337–340, (1938).

A brief description of the depressed bone marrow function due to arsphenamines is given. Some of the theories on the mechanism of production of this group of disorders are discussed. Hypoplastic changes of two cases and aplastic changes of one case are reported. Like past-arsenical encephalitis, there is a large element of unpredictability and inevitability about this group of blood disorders.

M. A.

61. **Sankaran, G.** and **Rajagopal, K.**—Haematological Investigations in South India. Part I. The estimation of haemoglobin. *Ind. Journ. Med. Res.*, XXV (3), pp. 741–751, 1 fig., (1938).

A critical discussion of the laboratory methods of estimating haemoglobin is given. It is concluded that the colorimetric method of Bing and Baker using a standard of known oxygen capacity determined directly by a van Slyke apparatus is the most practical. The advantages of expressing haemoglobin values in gm. per 100 ml. of blood rather than as percentages of an arbitrary standard are emphasised. In a group of healthy young South Indians the average haemoglobin value was 16·57 gm. per 100 ml. for males and 13·73 gm. for females. The conclusion reached is that the level of haemoglobin in healthy adults is the same in Indians as in Europeans.

G. S.

62. **Sankaran, G.** and **Rajagopal, K.**—Haematological Investigations in South India. Part II. The effect of the administration of iron on the haemoglobin level in Indian girls and young women. *Ind. Journ. Med. Res.*, XXV (3), pp. 753–761, 1 fig., (1938).

The haemoglobin values of girls and young women in two institutions in South India were found to average 16·35 gm. and 13·69 gm. per cent respectively. A diet survey showed that the average daily consumption of iron was between 22 mg. and 30 mg. Despite the high initial values of haemoglobin, the daily administration of 120 mg. of iron as ferrous sulphate raised the respective averages to 20·34 gm. and 18·44 gm. per cent. It is pointed out that no evidence is available as to whether the average value of haemoglobin is an optimal value for health.

K. R.

63. **Sankaran G.** and **Rajagopal, K.**—The Effect of Altitude on Haemoglobin Content. Part V. *Ind. Journ. Med. Res.*, XXV (4); pp. 971–978, (1938).

The haemoglobin content of the blood of a group of 28 British soldiers coming from sea level to an altitude of 6,000 ft. was investigated, using the authors' modification of Bing and Baker's method. The mean haemoglobin value of the first determination—4 days after arrival in the hills—was found to be 12·84 grms. per cent, with a standard deviation of 1·03 and a coefficient of variation of 8·1%. The maximum rise occurred in the third week, the mean Hb being 19·56 g. with a standard deviation of 1·40 and a coefficient of variation of 7·1%. There was no appreciable rise after this period, the determinations being continued for two months in all.

G. S. & K. R.

64. **Sankaran, G.** and **Radhakrishna Rao, M. V.**—Mean red-cell diameter of South Indians. *Ind. Journ. Med. Res.*, XXV (4), pp. 951–956, (1938).

A study of the mean red-cell diameter of South Indians was undertaken by a modified area method with a view to establishing normal standards. The method is simple and less time-consuming than the original Price-Jones' method. Data are presented of 25 cases, both males and females. A statistical analysis of the data showed for South Indians a mean red-cell diameter of 6·85μ, with a standard deviation of 0·28μ and coefficient of variation of 4·1 per cent. These figures show that the mean red-cell diameter of South Indians is somewhat smaller than that given by Price-Jones (7·202μ) for Europeans.

G. S. & M. V. R. R.

65. **Sokhey, S. S., Gokhale, S. K., Malandkar, M. A. and Billimoria, H. S.**—Red Cells, Haemoglobin, Colour Index, Saturation Index, and Volume Index Standards. Part II. Normal Indian Women: A study based on the examination of 101 women. *Ind. Journ. Med. Res.*, XXV (3), pp. 723–739, 8 figs., (1938).

Standards for the normal averages of the red cell count, heamoglobin and cell volume have been worked out by the study of the bloods of 101 healthy young women from the Bombay Presidency between the ages of 16 and 30 years. The methods used were the same as were used in a similar study of healthy young men by the same authors (*Ind. Journ. Med. Res.* 25 (2), p. 505, 1937). The averages obtained were: Red cell count 4·47 millions per c.mm., haemoglobin 12·99 g. per 100 c.c., and cell volume 36·27 c.c. per 100 c.c. The haemoglobin coefficient and the cell volume coefficient were 14·55 g. and 40·61 c.c. respectively. The average haemoglobin figure tallied with the only other average figure (12·93 g.) obtained by the van Slyke method as was the case with the average haemoglobin figure obtained in their study of men. The cell volume coefficient 40·61 c.c. was very close to the value obtained by the authors for men, 40·83 c.c., and shows that the average size of the red cells in men and women is the same. S. S. S.

HISTOLOGY AND PATHOLOGY.

66. **Gatenby, J. B., Singh, B. N. and Browne, K. M. R.**—Golgi apparatus material and the vacuole system in *Euglena* and *Copromonas*. *Cellule*, XLVII, pp. 229–236, (1938).

The Golgi apparatus developed in connexion with the base of the flagellum in primitive flagellates later became associated with the contractile vacuole. When the necessity for an osmo-regulatory system lapsed in the metazoa, the osmiophile material persisted as an organ associated with the removal of water from secretion products. B. N. S.

67. **Menon, T. B.**—Venous splenomegaly. Experimental portal congestion. *Journ. Path. Bact.*, XLVI, pp. 357–365, (1938).

Portal obstruction in small animals was induced by narrowing the lumen of the portal vein. The spleen was enlarged threefold and infarcted after complete occlusion of the vein. This enlargement was negligible after 3–6 months' partial obstruction. The spleen showed sinusal dilatation, distension of the pulp and trabecular veins, and atrophy of the pulp, but no hyperplastic reactions. B. M.

68. **Menon, T. B.**—Splenic reaction in experimental cirrhosis and in precirrhotic intoxication. *Journ. Path. Bact.*, XLVI, pp. 521–534, (1938).

In chronic intoxication with $MnCl_2$ (in rabbits) or senecoinine (in rats) there is necrosis of the marginal zone of the Malpighian follicles and the pulp cords of the spleen followed by collapse and overgrowth of the fibrillary reticulum and collagenisation; later fibrosis leads to an appearance similar to Banti's 'fibro-adenia'. There was increased erythrophagocytic activity and early splenomegaly. CCl_4 (in rat and guinea-pig) induced a marked proliferative reaction in the spleen and later, with development of portal cirrhosis, congestion was superadded. These experiments suggest that during the development of hepatic cirrhosis, there are fibrotic and proliferative reactions in the spleen and a definite splenomegaly independent of portal stasis. B. M.

69. **Radhakrishna Rao, M. V.**—The Study of Myelin Degeneration in Polarised Light. *Ind. Journ. Med. Res.*, XXVI (1), pp. 103–106, 12 figs., (1938).

Experimentally produced Wallerian degeneration in the sciatic nerves of rabbits was observed in polarised light with a view to testing the reliability of the polarised light technique, described by Sutton, Setterfield and Krauss (1934), in the microscopic diagnosis of myelin degeneration.

The progress of the degenerative changes in the distal segments of the nerves following transection was clearly brought out when frozen sections of the nerves, cut longitudinally and mounted in glycerine, were observed in polarised light between crossed Nicol prisms.

The method is simple, rapid and reliable.

M. V. R. R.

70. SHORTT, H. E., HAWLEY, H. and SWAMINATH, C. S.—Iron-haematoxylin staining technique—an illusion. *Ind. Journ. Med. Res.*, XXVI (1), pp. 259-260, (1938).

Since the introduction of the Heidenhein (1892) method of staining by aqueous solution of haematoxylin, after preliminary mordanting in aqueous solution of iron ammonium alum, great stress has always been laid on the necessity for using the alum salt in its purest form, *i.e.*, as violet coloured crystals.

In a series of experiments in which iron ammonium alum in various stages of natural and artificially induced decomposition was used it was found that satisfactory staining results were obtained, proving that the use of violet coloured crystals is not necessary.

A stable solution of iron ammonium alum in 0·5 per cent sulphuric acid is recommended for use.

H. E. S.

71. SUBRAMANIAM, M. K.—Studies on the Structure of Golgi apparatus. II. Liver cells of *Rhacophorus maculatus* Gray. *Proc. Ind. Acad. Sci.*, B, VII, pp. 80–103, (1938).

The mitochondria originate as vesicles and later become filamentous but have no relation to the secretion products. The Golgi apparatus, after mitosis, is composed of a number of separate pieces in which no chromophobic regions are visible. These come together to form a network. Chromophobic regions become differentiated as bleb-like swellings within various parts of the network. Secretory granules appear beside the Golgi apparatus and later occupy a large part of the cell. As the chromophobic parts of the Golgi apparatus become fully developed, the latter breaks up into osmophil fragments and largely disappears. Various modes of origin of secretion granules in relation to the Golgi apparatus in different forms are summarised and it is pointed out that the discovery of a chromophobic or idiosomic part of this apparatus in *Rhacophorus* makes possible a more satisfactory comparison of conditions in vertebrates and invertebrates.

M. K. S.

72. SUBRAMANIAM, M. K.—Studies on the Structure of the Golgi apparatus. III. Some observations on the Mechanism of Secretion of the Golgi Bodies in the intestinal cells of *Lumbriconereis*. *Proc. Ind. Acad. Sci.*, B, VII, pp. 125–131, (1938).

In a further study of the structure of the Golgi apparatus, the author has observed in alimentary canal cells of *Lumbriconereis* two types of secretion. In cells producing a watery mucous secretion, the Golgi apparatus consists of granules and vesicles. The secretion vacuoles arise in contact with the chromophilic rim of the Golgi vesicles. In cells producing the granular type of secretion, three types of association between the Golgi bodies and the secretory product were observed: (1) granules arose in intimate relation with the idiosome of the Golgi batonettes, (2) developing granules were closely pressed against small Golgi vesicles, and (3) typical Golgi batonettes, double-rimmed batonettes and Golgi vesicles were seen plastered on the surface of a secretory granule.

R. G.

CHOLERA.

73. BHARUCHA, F. R. and BHARUCHA, K. H.—The viability of certain pathogenic micro-organisms in various fresh fruits of India. *Journ. Univ. Bombay*, VI, pp. 35–40, (1938).

Since the water-melon was suspected to be one of the carriers of *V. cholerae*, it was attempted to find out experimentally if this was so. The results have shown that in vitro *V. cholerae* can survive for 94 hours in the water-melon juice.

F. R. B.

74. **KUNDU, K. P. and HOW, U. PA**—Prawns as a possible vector of *V. cholera*. *Ind. Med. Gaz.*, LXXIII, pp. 605-606, (1938).

The writers have isolated typical cholera vibrios from the prawns of the Deta district of Burma, where cholera occurs, and suggest further investigation whether they might be the possible vectors of the disease as they are extensively used by the people of this country.

K. P. K. & U. P. H.

75. **LINTON, R. W., SHRIVASTAVA, D. L. and SEAL, S. C.**—Studies on the specific polysaccharides of the vibrios. Part I. Effect of the Growth-medium. *Ind. Journ. Med. Res.*, XXV (3), pp. 569–574, (1938).

A vibrio has been grown on 8 different media and polysaccharides prepared from the centrifugate without the use of alkalis or mineral acids. It was found that the polysaccharides differed greatly in physical and chemical properties, and in their precipitin reactivity, although all were derived from the same organism and tested against the same homologous antiserum. The poorest yields and least active polysaccharides were obtained in media containing glucose, and it is probable that the active production of formic and acetic acids by the vibrios in these media account for the results. Polysaccharides prepared from growth in mutton infusion broth made up with 1 per cent Merck's peptone gave the best yield and the highest reactivity, *viz.*, 16·4 mg. per litre and a precipitin reaction at a dilution of 1: 16,000,000.

R. W. L.

76. **LINTON, R. W., SEAL, S. C. and MITRA, B. N.**—Chemical and serological variation in single-cell cultures of *Vibrio cholerae* and related organisms. *Ind. Journ. Med. Res.*, XXV (3), pp. 575–584, (1938).

The authors isolated single-cell cultures from several strains of vibrios, and noted their biochemical, cultural, and serological characteristics, as well as their chemical structure. By continued sub-cultures over a period of time and in various suitable media, variants from these strains were produced, having new biochemical, cultural, and serological characteristics, and a different chemical structure. It is emphasised that the characteristics of the chemical group into which the variants fell were shown completely by these variants, and that the changes brought about by variation are not at random but are correlated. The work appears to demonstrate a chemical basis for variation in the vibrios.

R. W. L.

77. **LINTON, R. W., SHRIVASTAVA, D. L., SEAL S. C. and MOOKERJI, S. P.**—Studies on the specific polysaccharides of the vibrios. Part II. Chemistry and Serology. *Ind. Journ. Med. Res.*, XXVI (1), pp. 41–54, (1938).

Specific polysaccharides have been prepared from 23 strains of vibrios from different sources and belonging to various chemical groups and their chemical and serological properties studied. Precipitin reactions between the polysaccharides and antisera to the whole organisms indicate that in general the serology expresses the underlying chemical pattern of these organisms, and indicates the same groupings as the chemical analysis done previously. Among the cholera strains, two chemically and serologically distinct types have been found. The chief point of difference is that the strains from the early part of the epidemic contain a lipoid-polysaccharide complex, which is absent in strains obtained from the latter part of the epidemic, in strains maintained for a long time in the laboratory, and in water and carrier strains. Water vibrios and carrier strains have been shown to be heterogenous among themselves.

R. W. L.

78. **PANDIT, S. R. and MAITRA, N. M.**—Vibrios in natural water sources in Assam. *Ind. Journ. Med. Res.*, XXVI (1), pp. 39-40, (1938).

Vibrios were isolated from 90 per cent of open water sources in Assam including wells, tanks, streams and ponds by cultivation of the samples at or near the pH of 9·0. The number of samples examined was 105 drawn from both hill and plain districts. The strains isolated belonged to all six Heiberg fermentation types but a large majority belonged to the non-fermenting type VI. Certain of the characters of Type VI vibrios in relation to *Bact. faecalis alkaligenes* have been studied. No material difference was noted in the incidence or the character of vibrios during the cold weather as compared with the hot weather period.

S. R. P.

79. Pasricha, C. L., De Monte, A. J. H. and Chatterjee, B. C.—Vibrio cholera from material obtained by liver puncture during life. *Ind. Med. Gaz.*, LXXIII, pp. 405-406, (1938).

Vibrio cholera were isolated from the material obtained from a liver puncture of a living boy of 7 years suffering from cholera and the vibrios isolated were indistinguishable from the vibrios isolated from the stool of the same patient.

B. M.

80. Pasricha, C. L., Chatterji, D. N. and Das, P. C.—The distribution and characteristics of vibrios isolated from certain non-human sources in Calcutta. *Ind. Journ. Med. Res.*, XXVI (1), pp. 33–38, (1938).

Three hundred samples of Calcutta waters, 640 flies and 94 cockroaches were examined for the presence of vibrios. Vibrios were isolated from all the samples of river water, 86 per cent of the tank waters, 19 per cent of flies and 17 per cent of the cockroaches examined. Vibrios were not found in tube-well water and in the municipal supply of drinking water when collected direct from the source of supply. A seasonal variation in the presence of vibrios was observed in the flies examined. Vibrios were present in 19 per cent of the flies examined in August and in only 6·8 per cent of the flies caught in December. The vibrios isolated from non-human sources resembled in their morphology and in their main biochemical reactions the *V. cholerae*. The majority of the strains belonged to Heiberg's Type 1 and 2. They were all inagglutinable with Inaba O serum and only 7 per cent showed H relationship with *V. cholerae*. A detailed serological study of 12 strains of the H agglutinable vibrios showed that in the majority there is more than one H antigen, one of which is common to the H antigen of *V. cholerae*.

C. L. P.

81. Taylor, J. and Ahuja, M. L.—Incidence and characters of vibrios in waters in Northern India. *Ind. Journ. Med. Res.*, XXVI (1), pp. 1–32, (1938).

The study was undertaken for the purpose of determining the distribution and characters of vibrios in natural water sources in Northern India. Ninety-one sources consisting of shallow wells, tanks and rivers were examined during the hot weather, monsoon and cold weather periods of 1937-38. The method of examination consisted of enrichment of large quantities of water with concentrated alkaline peptone solution followed by plating on Aronson's medium.

The results of these examinations show that vibrios are almost universally present in unprotected wells, tanks and rivers in areas of Northern India where cholera is not endemic and that their presence is in no way related to contamination from cholera sources. The vibrios are of very heterogenous types as determined by their biochemical and serological reactions. A considerable proportion possesses an H antigen in common with *V. cholerac* but no vibrio was isolated which showed 'O' serological relationship with that organism.

Many of the strains isolated showed 'O' serological relationship with vibrios other than *V. cholerae* isolated from cases of clinical cholera and from carriers in Bengal and other parts of India.

M. L. A.

82. Venkatraman, K. V. and Pandit, C. G.—An epidemic of cholera in a rural area in South India caused by the 'Ogawa' type of *V. cholerae*. *Ind. Journ. Med. Res.*, XXV (3), pp. 585–589, (1938).

The course of an epidemic of cholera in the Periyakulam range of Madura District (South India) was closely followed through 1936, with a view to studying the relation of the type of *V. cholerae* to the nature of the epidemic. In 39 villages, with a population of 181,668, there were 2,839 attacks and 1,257 deaths; these figures have been the highest for several years. Death occurred within 2 days after the onset of symptoms in 426 out of 481 fatal cases investigated. One hundred and thirty-one cases were submitted to bacteriological examination and *V. cholerae* isolated from 97. All the strains were typical in their morphological and biochemical characters. By agglutination and absorption tests, they were all shown to belong to the Ogawa' type of *V. cholerae*. The conclusion is drawn that *V. cholerae* of the 'Ogawa' type can cause a severe epidemic.

K. V. V.

PHARMACOLOGY (including Pharmacy).

83. BASU, U. P. and DE, S. P.—The chemotherapy of Streptococcal Infection. *Ind. Med. Gaz.*, LXXIII, pp. 35–40, (1938).

The writers have discussed the action of the Sulphonamide group of drugs on various types of streptococci. The authors are of opinion that these drugs have definite chemotherapeutic effects on *Streptococcus haemolyticus*.

B. M.

84. CHATTERJEE, B.—Observation on deterioration of physiological activity of Tinct. Digitalis. *Journ. Ind. Med. Association*, VII, pp. 579–584, (1938).

One hundred and twelve samples of Tr. digitalis, B.P. were biologically assayed and re-assayed against standard tinctures by a slightly modified method of Burn (Cat. Method). Eight per cent of the samples showed deterioration of 10–15 p.c. at the end of the first year: twenty-one per cent sample showed deterioration of 15–20 p.c. at the end of the second year and 56 p.c. showed deterioration of 20–40 p.c. at the end of the third year. If ± 25 p.c. for the tinctures were allowed to pass as satisfactory, then the results indicate that the drug remained fairly potent at least for two years in this country.

B. M.

85. CHOPRA, R. N., MUKERJI, B. and CHAKRAVARTY, M.—Studies on some dextro-rotatory hydrocupreidine derivatives. Part I. Hemolytic action. *Ind. Journ. Med. Res.* XXVI (1), pp. 279–288, 3 tables, text-fig., 2 graphs. (1938).

A comparative study of the hemolytic potency of a series of synthetic hydrocupreidine derivatives with their corresponding levo-rotatory isomers and quinine has been made. Suspensions of washed red blood corpuscles of rabbits and human beings in physiological saline were employed in the experiment. Two series of observations were made: (1) the minimum time for starting of hemolysis, keeping the concentration of the different salts constant, and (2) the minimum concentration just necessary to produce hemolysis, by keeping the time of exposure of the corpuscles to the different dilutions constant. The quantitative hemolytic potency of the different compounds in terms of quinine has been calculated from the 2nd series of observations. It was found that the dextro-rotatory hydrocupreidine derivatives were stronger hemolytic agents than quinine, the hemolytic potency increasing steadily as the higher homologues are reached. The addition of serum diminishes the hemolytic potency to a large extent. The hemolytic activity of the levo-rotatory hydrocupreines is almost parallel to the activity of their dextro-rotatory isomers.

R. N. C.

86. CHOPRA, R. N., DAS, N. N. and MUKERJI, B.—The Action of certain cardiac drugs on embryonic heart explants. *Ind. Journ. Med. Res.*, XXVI (1), pp. 271–278, graph 1, (1938).

It has been shown that hearts of chick embryos do not develop any nervous tissue before the 6th or the 7th day. In the present investigation, the effects of a few well-known cardiac drugs, *e.g.*, lanadigin (glucoside of *D. lanata*), thevetin (glucoside of *T. nerifolia*), strophanthin (glucoside of *G. Strophanthus*), Caffeine, and Cardiazol (Pentamethylene tetrazol), on these heart explants were studied in the hope that observations on such simple nerve-free embryonic preparations would throw light on the true mechanism of their action on heart tissue.

The effects on both the (1) fibroblastic growth of cell and the (2) rate of throbbing of the heart tissue were recorded. It was found that both lanadigin and thevetin stimulated the fibroblastic growth of tissue cells but inhibited the rate of beat of the heart explants. Strophanthin does not seem to possess any stimulant effect on tissue growth, but brings about a definite inhibition in the rate of throbbing. Caffeine and cardiazol are both stimulants to the growth of tissue cells as well as to the rate of beat of the cardiac explants. Caffeine further seems to prevent the normal occurrence of fatty degeneration in these explants and maintains the beats for a longer period than the controls kept under identical conditions.

R. N. C.

87. CHOPRA, R. N., CHATTERJEE, R. C. and GHOSH, S.—A preliminary note on the Chemistry and Pharmacology of the leaves of *Skimmia laureola* Hook, F. *Ind. Journ. Med. Res.*, XXVI (2), pp. 481–484, (1938).

An alkaloid was isolated which was shown to be identical with skimmianine found in *S. japonica*. The yield of the pure alkaloid amounts to 1·25 gm. per kilogram of powdered leaves. It is insoluble in petroleum ether, sparingly soluble in ether and cold absolute alcohol, soluble in hot alcohol and readily so in chloroform. It dissolves in dilute mineral acids only when they are present in excess. The hydrochloride salt of this alkaloid is readily soluble in water, the resulting pH of the solution being 1·3 to 1·6. Other salts of the alkaloid were prepared but they are not soluble except in excess of acid. Its pharmacological action could not therefore be worked out.

R. N. C.

88. CHOPRA, R. N., GHOSH, S. and DUTT, A. T.—Some inorganic preparations of the Indian Indigenous Medicine. Part VI. *Samudra Phena. Ind. Journ. Med. Res.*, XXVI (2), pp. 485-486, (1938).

'*Samudra Phena*' is the calcareous shell of a sea fish, probably of *Sepia officinalis*. The result of quantitative analysis of a sample received is as follows:—Lime, CaO, 49·725 per cent; Silica, SiO_2, 0·580 per cent; Iron, Fe_2O_3, 0·324 per cent; Alumina, Al_2O_3, 0·102 per cent; Phosphoric acid, P_2O_5, 0·048 per cent; Carbon dioxide, CO_2, 38·560 per cent; NaCl, 1·670 per cent; Potash, K_2O, trace; Magnesia, trace; Sulphates, trace; moisture, 3·925 per cent; and organic matter, 5·066 per cent. The amount of nitrogen in the organic matter amounted to 0·364 per cent of the total. Of the total calcium, the major portion is present as carbonate and the balance, 0·649 per cent, probably as organic calcium. *Samudra phena* mixed with other ingredient is used in Hindu medicine and is a common household remedy for ear ache and skin diseases. Whatever action it has is probably due to the large quantities of calcium salts present in it.

R. N. C.

89. CHOPRA, R. N., DUTT, A. T., CHATTERJEE, N. R. and GHOSH, S.—Chemistry of the roots of *Paris pophylla*. I. *Arch. Pharm.*, CCLXXVI, pp. 343–345, (1938).

The roots contain 7·92% of a crystalline reducing sugar, and a cryst., m.p. 238–240; and an amorphous glucoside, m.p. 162–164. This glucoside has been found to possess marked physiological activity. Detailed work on the pharmacology of the drug is in progress.

R. N. C.

90. CHOPRA, R. N. and GHOSH, N. N.—Chemistry of the Indian varieties of aloe; *A. vera* or *A. indica*, Boyle. *Arch. Pharm.*, CCLXXVI, pp. 348–350, (1938).

This variety of aloe, which is available in fair quantities in India, contains volatile and non-volatile oils, chrysophanic acid, and (?) emodin and coumarin, but no aloin. It has little or no purgative action, as compared with the pharmacopoeial variety of aloe.

R. N. C.

91. Chopra, R. N. and Ghosh, N. N.—Chemistry and pharmacology of leaves of *Erythroxylon monogynum*, Roxb. (bastard sandal). *Arch. Pharm.*, CCLXXVI, pp. 240–343, (1938).

The leaves contain an essential oil (responsible for its tonic properties), a flavone derivative, m.p. 180–185 (decomp.) and a trace of a cinnamoyl ester, cinnamoylcocaine (?) which has no anaesthetic action. No other pharmacologically active constituents have been isolated.

R. N. C.

92. Chopra, R. N., Ghosh, N. N. and Ghosh, S.—Chemistry and pharmacology of young shoots of *Bambusa arundinacea*. *Arch. Pharm.*, CCLXXVI, pp. 351-353, (1938).

The young shoots contain 0·03% of HCN and 0·23% of free benzoic acid, the expressed juice containing 0·027 and 0·16%, respectively. The presence of these constituents probably accounts for the therapeutic properties reported.

R. N. C.

93. De, S. P. and Basu, U. P.—Chemotherapeutic Study of Streptococcal Infections. *Ind. Journ. Med. Res.*, XXVI (2), pp. 537-540, (1938).

In *in-vitro* experiments the replacement of the amido hydrogen of p-amino benzene sulphonamide by a dialkylamino alkyl chain, or, a 8-amino quinoline derivative does not enhance the bacteriostatic action of the drug against streptococci. The dihydrochlorides of the latter compounds are again being found to be too toxic for mice. It would, however, be of interest to study their effect on malarial parasites.

U. P. B.

94. De, S. P. and Basu, U. P.—Synergy in experimental chemotherapy of staphylococcal infections. *Brit. Med. Journ.*, II. pp. 564-565, (1938).

Sulphanilamide + combined antitoxic and antibacterial staphylococcal serum protected mice against intraperitoneal infection with *S. aureus*. Untreated controls showed 100%, and those given the drug or serum alone showed a 70%, mortality rate.

B. M.

95. Dey, B. B., Lakshmikantham, P., David, J. C. and Krishnaswami, R.—Preparation, properties, and pharmacological action of p-aminobenzoyl-aminomethyl-1-hydrocotarnine. *Ind. Journ. Med. Res.*, XXV (3), pp. 713–721, 1 fig., (1938).

p-aminobenzoyl-aminomethyl-1-hydrocotarnine is one of a series of substances derived from narcotine studied by the authors. Its preparation is described. It was found to be of equal toxicity with cocaine and showed some local anæsthetic action. The local anæsthetic action tested by the intradermal wheal method is equal to that of cocaine, but the compound produced anæsthesia of the rabbit's cornea much more readily, the effect on the human cornea being disappointing.

J. C. D.

96. Dikshit, B. B.—Pharmacology of Plasmoquine with special reference to its action in pregnancy. *Proc. Nat. Inst. Sci. India*, IV, pp. 161–164, (1938).

Toxicity tests on protozoa and bacteria show that plasmoquine, an anti-malarial drug synthesised at the Bayer Laboratory, Germany, is not toxic to these organisms. The drug has no antipyretic action of its own, but in combination with quinine, the temperature is lowered quicker than quinine alone. The cardiovascular system is depressed by small doses of plasmoquine, large doses producing a cardiac irregularity. The gastro-intestinal motility is depressed and toxic doses produce a fatty degeneration of the liver.

The contractions of the isolated human or animal uterus are increased by low concentrations of plasmoquine and decreased by high ones. Contractions of the intact animal uterus are not affected by administration of therapeutic doses of plasmoquine given over a period of 5 days. Therapeutic or even toxic doses of plasmoquine given to pregnant guinea-pigs do not produce an abortion. The fact that a combination of quinine and plasmoquine antagonises the stimulant effect of each on the isolated uterus is interesting from a clinical point of view, for such a combination has proved useful in the treatment of malaria.

B. M.

97. Gupta, P. C.—Experiments with sodium iodoacetate. *Arch. int. Pharmocodyn.*, LVIII, pp. 158–164, (1938).

Sodium iodoacetate in 10^{-10} solution stimulates the heart. In more concentrated solution, it depresses activity and may cause arrest either in diastole or systole.

B. M.

98. Mukerji, B.—The Ergot Problem and the Practitioner. *Ind. Med. Gaz.*, LXXIII, pp. 355–383, (1938).

The chemical composition and the pharmacological action of the various alkaloidal constituents of ergot have been discussed with special reference to the quality of the liquid preparations of ergot available in the Indian market. As a result of biological and chemical assay of a large number of liquid extracts of ergot, the author finds that a very large proportion of these are either deteriorated or are substandard and understrength. The factors responsible for this are (i) deterioration of crude ergot, (ii) faulty method of extraction by the manufacturers, many of whom use ordinary crude petrol instead of petroleum ether for defatting ergot powder, (iii) imperfect assays before releasing finished products into the market, and (iv) deterioration of liquid extracts in the hot and humid climate of this country. Unless the deterioration factor can be controlled, for which studies have already been undertaken, the author thinks that practitioners would be better advised to use purified active principles preferably those belonging to the Ergometrine class of alkaloids or standardised, dried whole ergot powder. Unlike liquid preparations, these are not liable to rapid deterioration and are therapeutically effective.

B. M.

99. Mukerji, B. and Iyengar, N. K.—Studies on some Dextro-Rotatory Hydrocupreidine Derivatives. Part II. Comparative action on digestive enzymes. *Ind. Journ. Med. Res.*, XXVI (1), pp. 289–294, (1938).

The comparative inhibitory action of a series of dextro-rotatory hydrocupreidine derivatives and their corresponding levo-rotatory isomers on salivary and pancreatic amylase and on yeast invertase was studied. Quinine has been taken as the standard for comparison.

The method of Wilstatter, Waldschmidt-Leitz and Hesse (*Z. physiol. chem.* 126, 143, 1923) was employed. The particular compound to be tested was added in a concentration (0·1%), which is approximately equivalent to the concentration in the digestive secretions of a therapeutic dose (10 grains) of quinine. The reaction mixtures were maintained under optimum conditions with regard to temperature, pH, etc., for enzyme action. Contrary to previous reports, the levo-rotatory hydrocupreines were found to be far more powerful inhibitors to the amylases than the dextro-rotatory hydrocupreidines. Quinine comes in between the groups, being generally weaker than the higher members of levo-rotatory hydrocupreines but stronger than the dextro-rotatory hydrocupreidines. The lower members of the hydrocupreidine series do not appear to possess any inhibitory action at all on invertase activity while the higher homologues are definitely more potent in this regard. The possible mechanism of this inactivation has been discussed.

B. M.

100. Sen, B. B. and Ghosh, B. N.—A comparative study of the effects of serotherapy, chemotherapy and combined therapy in Experimental Streptococcus infections. *Calcutta Med. Journ.*, XXXIV, pp. 275–284, (1938).

The authors have made a comparative study of the toxicities of Sulphonamide, Disulphanilamide and Urea sulphazide on animals. They find that the introduction of urea grouping into the compositions of a sulphonamide derivative tends to make the compound Urea sulphazide less toxic. The authors have also carried out therapeutic tests of this new compound with promising results. However, combined therapy with antiserum and Urea sulphazide has given better results in controlling streptococcal infections than the single administration of either a serotherapeutic or a chemotherapeutic remedy.

B. B. S. & B. N. G.

FOODS AND NUTRITION.

101. AHMAD, B. and GORE, H. K.—A diet survey of fifty-one families of Ferozepore, Punjab. *Ind. Journ. Med. Res.*, XXVI (1), pp. 155–164, (1938).

The diet of the typical representative families of the community is generally vegetarian. The quantity of food as regards energy requirement is adequate. The intake of fruits and raw vegetables is low, green leafy vegetables being almost absent. Milk and milk products are the only source of animal protein; and since their supply in the diet is not very generous, the diets on the whole are deficient in animal protein, particularly for the needs of children, pregnancy and lactation.

H. K. G.

102. AYKROYD, W. R. and KRISHNAN, B. G.—The Treatment of Stomatitis caused by Diet Deficiency. *Ind. Journ. Med. Res.*, XXV (3), pp. 643–646, (1938).

Stomatitis occurring in children living on a diet largely composed of milled rice can be cured by alkali autoclaved yeast with no other change in the diet. It is suggested that the factors concerned is identical with the P-P factor. The problem then arises why absence of this factor in a diet composed largely of polished rice should give rise to only one of the signs of pellagra seen in maize eaters.

W. R. A.

103. AYKROYD, W. R., MADHAVA, K. B. and RAJAGOPAL, K.—The Detection of Malnutrition by Measurements of Arm, Chest, and Hip. *Ind. Journ. Med. Res.*, XXVI (1), pp. 55–94, (1938).

The A.C.H. index of 3,500 South Indian children has been taken, and the correlation between selection by the index and the presence of physical signs of malnutrition (Bitot's spots, phrynoderma, and angular stomatitis) determined. A full statistical analysis of the data is given and a discussion on the value of the index in the detection of malnutrition.

W. R. A.

104. BASU, K. P. and DE, H. N.—Nutritional investigation of some species of Bengal Fish. Part I. *Ind. Journ. Med. Res.*, XXVI (1), pp. 177–190, (1938).

1. The biological values of proteins of steam-dried ruhee fish (*Labeo Rohita*), by the balance sheet method at 5, 10 and 15 per cent levels of protein intake are 82·3, 78·9 and 72·5 respectively. The corresponding values for hilsa fish (*Clupea Ilisa*) proteins are 78, 69·5 and 62·1. Body-weight of rats has no effect on the biological value.
2. The biological values of proteins of steam-dried ruhee fish by the growth method at 5, 10 and 15 per cent levels of protein intake are 1·47, 1·55 and 1·71 respectively, while the corresponding values for the steam-dried hilsa fish proteins are 0·25, 1·32 and 1·48.
3. Sun-dried ruhee fish meal has a higher value than the steam-dried meal both for the maintenance of nitrogen equilibrium and also for promoting growth in young rats. The sun-dried hilsa fish does not possess any statistical increased value for the maintenance of nitrogen equilibrium but has a higher value for promoting growth in young rats. The digestibility of the sun-dried product is also greater.
4. Appreciable supplementary relation exists between the proteins of ruhee and proteins of the pulses, *Lathyrus sativa* and lentil as observed by the balance sheet method. Marked supplementary effect of the proteins of the ruhee fish on the proteins of the pulses lentil, *Lathyrus sativa*, green gram and field-pea in promoting growth was observed and this is of great practical importance in human dietetics,

K. P. B.

105. **Basu, K. P. and De, H. N.**—Nutritional investigation of some species of Bengal Fish. Part II. *Ind. Journ. Med. Res.*, XXVI (1), pp. 191–196, (1938).

1. The percentage of total nitrogen extractable by different solvents is 96·4 in the case of ruhee (*Labeo Rohita*) and 93·0 in the case of hilsa (*Clupea Ilisa*).
2. Optimum sodium chloride concentration for extraction is 2 per cent solution.
3. From ruhee, water extracts 32·4 per cent, salt extracts 5·2 per cent, 75 per cent alcohol extracts 3·2 per cent and 0·2 per cent alkali extracts 55·6 per cent proteins; the corresponding values for hilsa are 26·8, 9·9, 2·6 and 53·7 per cent respectively.
4. The globulin and the glutelin constitute the greater proportion of proteins in both the cases. The aqueous extracts contain mostly globulin. On cooling the aqueous extracts in the refrigerator small amounts of albumin are obtained in both the cases, but the amounts are too small for analysis. The aqueous extract of ruhee contains small amounts of an albumin coagulating at 45°C.
5. The nitrogen distribution of ruhee and hilsa fish globulin and glutelin has been determined by the method of van Slyke as modified by Plimmer and Rosedale.
6. Tyrosine and the tryptophane contents of the proteins have been determined by the colorimetric method of Folin *et al.* Tryptophane contents of both hilsa and ruhee proteins are equal. Ruhee glutelin contains more tyrosine than the hilsa glutelin.
7. Ruhee fish proteins contain more sulphur-containing amino-acids than the hilsa fish proteins.

K. P. B.

106. **Basu, K. P. and De, H. N.**—Nutritional investigation of some species of Bengal fish. Part III. *Ind. Journ. Med. Res.*. XXVI (1), pp. 197–204, (1938).

The vitamin-A potency of the liver oil is higher in the case of ruhee fish (*Labeo Rohita*) than in the case of hilsa (*Clupea Ilisa*). The International Units of vitamin A contained in one gramme of the liver oil of ruhee and hilsa are 461 and 120 respectively.

The potency of the body oil of ruhee is 109 units per gm., while that of hilsa is nil.

The figures are computed by comparison with a sample of the international standard carotene.

K. P. B.

107. **Chatterjee, A. C.**—Physical Development and Nutrition of the Bengalee Schoolboy. *Ind. Jour. Pediat.*, V, p. 136, (1938).

The results of the routine medical examination of students in schools and colleges of Calcutta and its suburbs by the Students' Welfare Department of the Calcutta University during the period (1920–1936) are discussed. The findings are based on an analysis of 33,151 students containing the average figures for height, weight, height-weight index, chest measurements and strength of grip. The average figure for vital capacity are based on an examination of 7,722 students and that of blood pressure on 4,175 students.

A. C. C.

108. **Giri, K. V.**—The Availability of Phosphorus from Indian Foodstuffs. *Ind. Journ. Med. Res.*, XXV (4), pp. 869–878, (1938).

Cereals, pulses, oilseeds and nuts, vegetables and tubers commonly used in Indian dietary were tested for their total P, phytin P and phytase content. A large part (50–70%) of the phosphorus contained in cereals commonly used in India is present as phytin, which is not available for nutrition. Pulses, oilseeds and nuts contain 20–60% of phosphorus as phytin P, while roots and tubers contain very little of phytin P. Green vegetables and leaf vegetables do not contain phytin, thereby showing that the phosphorus contained in these foodstuffs is completely available for nutrition.

The phytin content is found to decrease on soaking the seeds in water. With the ripening of the grain there is an increase in the phytin content. Immature grains are therefore good sources of available phosphorus than matured ones. The phytase activities of tubers, vegetables and leaves are found to be very high compared to those of cereals. The importance of this enzyme in phytin nutrition is discussed.

K. V. G.

109. GOSWAMI, H. and BASU, U. P.—Available Iron in Indian Foodstuffs. *Ind. Journ. Med. Res.*, XXVI (4), pp. 893–900, (1938).

In ascertaining the 'available' iron content of those foodstuffs, known to be richer in iron content and grown in and near Calcutta (Bengal), it has been found that the percentages of the availability in cereals, pulses, leafy and non-leafy vegetables, nuts and fruits are 58·5, 72·4, 34·2, 56·0 and 65·4 respectively. The amount available from different types of diet has been discussed. Pala (*Curcuma Zeodoria*) contains 0·02% calcium, 0·045% phosphorus, 0·046% protein but 0·0037% 'available' iron. It is suggested that milk-cereal diets of children may be reinforced with this food.

U. P. B.

110. KRISHNAN, B. G.—Skimmed Milk and the Growth of School Children. *Ind. Journ. Med. Res.*, XXV (3), pp. 647–654, (1938).

The addition of 8 ozs. of skimmed milk per day to the diet of a group of children in one day-school in Madras and in one in Coonoor produced in three months significant increases in height and weight over the control groups and confirmed the results previously obtained in boarding schools. The cost of this dietary supplement is approximately 12as. per child per month.

B. G. K.

111. MITRA, D. D.—A study of the dietary habits of some communities living at Calcutta. *Ind. Med Gaz.*, LXXIII, pp. 280–282, (1938)

An attempt has been made to find out the dietary habits of four communities, *viz.*, Bengalee Hindus, Marwaris, Mohammedans and Anglo-Indians, making use of a 'daily index', which has been taken as the ratio of the number of times a particular item of food is consumed each day to the number of persons consuming it. Some of the maximum indices are as follows: Rice 1·6 (Bengalee Hindus); bread 2·8 (Anglo-Indians); pulses 1·5 (Bengalee Hindus); vegetables 2·4 (Bengalee Hindus); fish 1·4 (Bengalee Hindus); meat 1·3 (Mohammedans and Anglo-Indians). It appears that the Mohammedans and the Anglo-Indians take the pulses and vegetables less often, and meat, fish and eggs more often than the Hindus, amongst whom there are large sections like the Marwaris who are vegetarians. The Anglo-Indians consume a diet which is poor in calcium, phosphorus and vitamins of the B group.

R. C. G.

112. MITRA, K.—Nutrition in Bihar. II. Local foodstuffs. *Journ. Ind. Chem. Soc.*, XV, pp. 623–628, (1938).

Data are given for the contents of water, protein, fat, carbohydrate, crude fibre, calcium, phosphorus, and iron and the calorific value of various cereals, vegetables, fish, and mixed foods.

K. M.

113. MOZUMDAR, B. N. and DE, N. K.—The oxalic acid content in some Indian foodstuffs. *Ind. Journ. Med. Res.*, XXV (3), pp 671–675, (1938).

Fifty-two common foodstuffs including cereals and pulses, vegetables, fruits, animal foods and beverages have been analysed for their oxalic acid content by a slight modification of the usual volumetric method. Amongst the vegetables, rhubarb and spinach are the richest in this regard containing 1336·0 mgm. and 658·0 mgm. per 100 gm. respectively. Amongst the cereals and pulses, ragi (45·7 mg. per 100 gm.) and amongst the fruits, almond (407 mg. per 100 gm.) are the richest. Animal foods seem to contain very little and this is also true of ordinary fruits. The oxalic acid content of cocoa was found to be high, approximating to that of spinach. Milk contains oxalic acid in almost negligible amounts.

R. C. G.

114. NARASIMHAMURTY, G.—The Nitrogen Complex of Indian Foodstuffs. Part II. Chillies (*Capsicum annum*) and coriander seeds (*Coriandrum sativum*). *Ind. Journ. Med. Res.*, XXV (4), pp. 863–868, (1938).

The nitrogen complex of the edible portions of two Indian condiments, dry chillies (*Capsicum annum*) and coriander seeds, was investigated for its protein and non-protein

fractions. Analysis was carried out on the defatted materials, to determine the nitrogen existing as the humin, amide, non-basic amino and non-amino, and the basic amino and non-amino nitrogen. In the basic fraction nitrogen present as arginine, histidine and cystine, was also investigated and lysine nitrogen obtained by difference from the total basic nitrogen. Tyrosine and tryptophane were colorimetrically estimated on separate samples of the defatted seed powders. The proportion of extractable nitrogen and non-protein nitrogen in chillies happen to be greater than in coriander seeds. Histidine and tryptophane were present in very small amounts, while cystine is absent.

G. N.

115. PAL, R. K. and SINGH, N.—The effect on rats of supplementing a North Indian diet with vegetable proteins (sprouting pulses) and calcium. *Ind. Med. Gaz.*, LXXIII, pp. 469–471, (1938).

Addition of sprouted Bengal gram and calcium, separately or together, enhances the nutritive value of a poor North Indian diet. The increase in weight on a supplement of sprouted Bengal gram is mostly due to development and growth of muscles, whereas calcium as a supplement promotes better growth and development of the bones and the skeleton, which are mostly responsible for the increase in weight. A combination of both as a supplement, produces an algebraic sum of the effects due to each and as such, acts better than either of them individually.

R. C. G.

116. PAL, R. K. and SINGH, N.—The effect on rats of supplementing a South Indian diet with calcium and phosphorus. *Ind. Journ. Med. Res.*, XXV (3), pp. 693–702, 12 figs., (1938)

Experiments were set up with four groups of young rats consisting of an equal number of males and females with a basal diet corresponding roughly to the daily diet, based on rice as a staple, of an adult of the poorer classes in South India. The first group was given the basal diet, the second received in addition 1·8 g. of calcium lactate, the third 0·8 g. of alkaline potassium phosphate and the fourth group both calcium lactate and alkaline potassium phosphate as daily addition to the usual diet. The experiment which lasted for ten weeks shows that the addition of calcium enhances the nutritive value of Indian diets based on rice as assessed by better growth of group II of the experiment than group I. This effect is slightly increased if phosphorus is also added at the same time as in group IV. The addition of phosphorus alone in the form of alkaline potassium phosphate has no supplementary effect on growth as noticed in group III which throughout the experiment consumed much less food and the histological changes in the intestines, and the thyroid gland too, were suggestive of inanition.

In groups receiving the basal diet and the basal diet supplemented by phosphorus changes indicative of hypofunction were observed in the parathyroid glands, which was corroborated by low blood calcium and high blood phosphorus content in these groups. These changes were not observed when the diet was supplemented by calcium or by calcium and phosphorus given together.

R. K. P.

117. PAL, R. K. and SINGH, N.—Further studies on the effect in rats of supplementing a South Indian diet with calcium and phosphorus. *Ind. Journ. Med. Res.*, XXVI (1), pp. 95–102, (1938).

Feeding experiments were carried out on two groups of young rats of an average weight of 55 gms. for eight weeks. One group was given a poor South Indian diet, while the other group was given 0·07 gm. of alkaline potassium phosphate per rat as a supplement to the basal diet. The quantities of calcium, phosphorus and nitrogen retained by the two groups of animals were estimated every week during the experimental period. 0·5 c.c. of a saturated solution of alizarin red was injected into each animal twice a week throughout the experimental period in order to determine the amount of calcium deposited in the growing bones of the animals. At the end of eight weeks, all the animals were bled to death under anæsthesia, and calcium, phosphorus and protein contents of their blood were estimated. The thyroid and parathyroid glands were also taken out for histological examination. The final length of the skeleton and average length of individual bones were also measured. On the basis of the experimental results it was concluded that (*a*) the nutritive value for rats of a diet based on rice resembling that consumed by the poorer classes in South India was improved by the addition of basic calcium phosphate. The improvement was evidenced by greater increase in weight, greater length of body and femur and by more efficient calcification of bone; (b) the calcium content of the blood was greater in the group receiving the supplement than in the other group, the reverse being observed in the case of phosphorus; (3) changes suggestive of hypo-activity were observed in the parathyroid glands of the animals on the basal diet alone. The parathyroids of those receiving the calcium phosphate supplement appeared to be normal.

R. K. P.

118. **Patwardhan, V. N. and Chitre, R. G.**—Studies in calcium and phosphorus metabolism. Part I. The calcium and phosphorus content of the soft tissues of normal rats. *Ind. Journ. Med. Res.*, XXV (3), pp. 633–642, (1938).

Batches of normal rats of 150–200 days in age from three different diet groups were killed and the Ca and P content of different soft tissues estimated. Large variations in the amounts of Ca and P in the soft tissues were observed. The variation was least, however, in rats belonging to the same diet group and of approximately the same age. The lungs were found to contain the highest amount of Ca of all the tissues examined and the liver the least. The amount of P was found to be greater in brain, spleen, testes and lungs than in the other tissues examined. In the spleen of rats suffering from extreme starvation the amount of Ca increased by about 120 per cent. The mean value of Ca in the liver was, however, unaltered by change of diet or by starvation.

V. N. P.

119. **Patwardhan, V. M. and Chitre, R. G.**—Studies in calcium and phosphorus metabolism. Part II. The effect of toxic doses of Vitamin D on the ash, Ca, and P content of the bones and on the excretion of N, Ca, and P in the albino rats. *Ind. Journ. Med. Res.*, XXVI (2), pp. 447–458, (1938).

Irradiated ergosterol (Vigantol) was administered to adult albino rats orally and subcutaneously in doses of 4500 I.U. per rat per day. The subcutaneous administration proved more toxic than the oral administration. The urinary nitrogen rose while the food intake remained stationary or diminished. The urinary Ca and P also increased. In rats receiving Vigantol the phosphorus retention was very low as compared with that of the controls. Both Ca and P retentions were reduced but that of P more so. The ash content of the bones of hypervitaminotic rats was reduced; Ca : P ratio was altered to the mean value of 2·585 as compared with 2·226 in the normal rats.

V. N. P.

120. **Ranganathan, V. and Rau, V. V. S.**—Effect of addition of calcium on the biological value of the Proteins of Indian Diets. *Nature*, CXLII, p. 165, (1938).

It was found that the proteins of the Madras diet gave a biological value of 44 at 10 per cent protein level, though rice with a biological value of about 83 formed the major item of the diet. It was thought possible that the low biological value might be due to a low content of calcium in the diet. Subsequently, after the addition of calcium to the diet, the biological value was seen to increase from 44 to 76, and the digestibility from 64 to 89, even though the calcium content in the Madras diet is just enough according to Sherman's accepted standard for an adequate diet.

R. G.

121. **Ranganathan, S.**—The available iron in some common Indian foodstuffs, determined by the 2 : 2′-dipyridine method. *Ind. Journ. Med. Res.*, XXV (3), pp. 677–684, (1938).

One hundred common Indian foodstuffs have been analysed for their available iron by a modified chemical method of Kohler *et al* involving the use of 2: 2′-dipyridine. The foodstuffs analysed were found to vary widely as regards the percentage of total 'available' iron. In general, leafy vegetables and condiments and spices, which are usually considered good sources of iron, are reported to contain a low percentage (30 to 40%) of 'available' iron. Percentage 'availability' in the various groups of foodstuffs was very variable.

S. R.

122. **Ranganathan**, S.—Variations in the Iron Content of Foodstuffs and the Problem of Iron Requirements. *Ind. Journ. Med. Res.*, XXVI (1), pp. 119–130, (1938).

The practice of computing the iron content of human dietaries from tables of food analyses was critically considered. Wide variations exist in the iron content of foodstuffs reported by different workers; the effect of such variations in the computations of the iron content of human dietaries was demonstrated. Again, in laboratory determinations of the iron content of foodstuffs, special precautions are taken to avoid iron contamination. But calculations of the iron content of diets from figures in food value tables do not take into account the accretion of iron through contamination during the storage and preparation of foods, which may be very considerable. The problem is further complicated by conflicting data regarding total iron requirements, and by the concept of 'available' iron. In view of these, the conclusion is drawn that the calculation of the total iron content of dietaries from standard food value tables is of very dubious value.

S. R.

123. **Rao**, B. S.—Investigation on rice. *Current Science*, VI, No. 9, pp. 446-447, (1938).

The author looks upon rice as a colloidal system intermediate between the lyogel and the xerogel. Important colloidal changes take place in the rice kernel during the later stages of the maturing of paddy. The lyogel loses water and there is a drift towards the xero state, which is characterised by rigidity of structure. Rice from freshly harvested paddy does not cook well and is not properly digested because the drift to the xero state has not advanced sufficiently. The optimum temperature for the heat treatment of paddy, the need of storage of paddy, the swelling of rice, the preservation of rice bran and polishings without detriment to flavour and the vitamin B_1 content are some of the important points that are investigated in this work.

R. C. G.

124. **Rau**, Y. V. S. and **Ranganathan**, V.—Biological value of the proteins of a few typical Indian diets. *Proc. Soc. Biol. Chem. India*, III, pp. 64-65, (1938).

The biological value, digestibility, and availability of the proteins, and also the calcium and phosphorus contents, of diets typical of various parts of India are determined.

B. M.

125. **Rau**, Y. V. S. and **Ranganathan**, V.—Non-protein-nitrogen of vegetables. *Current Science*, VI, pp. 609-610, (1938).

Data for the non-protein-N distribution of drumstick leaf, drumstick, amaranth, and cabbage are tabulated. The value of the non-basic, non-amino-N is high.

B. M.

126. **Rudra**, M. N.—Rôle of Manganese in the biological synthesis of ascorbic acid. *Nature*, CXLI, p. 203, (1938).

Speculation on a possible explanation of the difference in ascorbic acid contents of different plants led the author to the idea that this difference may be due to the activating influence on the synthesis of ascorbic acid by plants of some mineral or minerals which are not detectable by ordinary analytical methods. By germinating Bengal gram in distilled water and in solutions with manganese equivalents of 1 in 10^6, 1 in 10^5 and 1 in 10^4, it was found that the amounts of ascorbic acid synthesised in the latter solutions are higher than those produced in the distilled water. Manganese therefore plays an important part in biological synthesis.

R. G.

127. **Seal**, S. C.—Diet and the incidence of disease in India. *Ind. Med. Gaz.*, LXXIII, pp. 291–301, (1938).

The author is of opinion that a general dietetic deficiency is more or less prevalent all over the country and that, apart from the clinically-defined deficiency diseases, a subclinical state of deficiency is the primary cause of the general ill-health and lowering of resistance of the various races and nationalities represented in India and is indirectly responsible for the most severe ravages in this country of the various tropical diseases, such as malaria, kala-azar, tuberculosis, leprosy, cholera, gastro-intestinal disorders, anaemias, diarrhoeas, dysenteries, etc.

R. C. G.

128. Shourie, K. L. and Singh, N.—A Diet Survey of a Group of Sikh Soldiers. *Ind. Journ. Med. Res.*, XXV (3), pp. 655–660, 1 fig., (1938).

A survey of a group of Sikh soldiers stationed in the Nilgiris showed their diet to be adequate in all respects, and suitable for the requirements of military service.

K. L. S.

129. Sreenivasan, A.—Investigations on rice. *Current Science*, VI, No. 12, pp. 615-616, (1938).

The nature of parboiling has been studied from an examination of the attendant changes in the different constituents of the rice grain as a result of polishing to varying degrees. Parboiling results in a partial gelatinisation of the starch in the superficial layers of the endosperm; in some cases the gelatinisation extends well into the interior.

The changes during storage have been studied by following the volume expansion on cooking of rice obtained from paddy immediately after harvest and after different periods of storage. The results suggest that the rate of improvement in cooking quality is greatest in samples stored in airtight containers or under anaerobic conditions. The cooking of freshly harvested rice to a pasty consistency is due to the presence in the grain of a fairly active α-amylase which during storage passes into a dormant condition.

R. C. G.

130. Subrahmanyan, V.—Rôle of minor elements in nutrition. *Proc. Soc. Biol. Chem. India*, III, pp. 40–49, (1938).

The biological importance of some of the less common minerals, in diets and as medicaments or poisons, is discussed. Reference is made to their actions on plants and micro-organisms.

B. M.

131. Swaminathan, M.—A Colorimetric Method for the Estimation of Nicotinic Acid in Foodstuffs *Nature*, CXLI, p. 830, (1938).

A colorimetric method for the estimation of nicotinic acid, the probable pellagra-preventive factor, has been developed. The nicotinic acid content of twelve common foodstuffs, as determined by the colorimetric methods, is also given. Values ranged from 1·48 mgm. per cent for maize up to 62·5 mgm. per cent for fried brewers' yeast.

B. M.

132. Swaminathan, M.—The relative amounts of the protein and non-protein constituents occurring in foodstuffs and their significance in the determination of the digestibility coefficient of the proteins. *Ind. Journ. Med. Res.*, XXV (4), pp. 847–856, (1938).

The relative amounts of the protein and non-protein nitrogenous constituents occurring in certain cereals, pulses, nuts, oilseeds, condiments, vegetables and milks, have been determined by the Stutzer method. The average amounts of non-protein nitrogen, expressed as % of total nitrogen, occurring in the different groups of foodstuffs were as follows: cereals 5%; pulses 9%; nuts and oilseeds 5%; condiments 6%; vegetables 14% and milks 9%. The method of estimating the protein content of a food by multiplying the total nitrogen content by the factor 6·25 is not fully justified since appreciable amounts of non-protein nitrogen, non-amino and non-peptide in character, form part of the total nitrogens considered in terms of practical dietetics, the error involved, however, is not of great importance. If the protein content of a food is determined by multiplying the total nitrogen content by 6·25, the digestibility coefficient may be underestimated, owing to the presence of varying amounts of non-protein nitrogen, which may be poorly available in digestion.

M. S.

133. SWAMINATHAN, M.—The Relative Value of the Proteins of certain Foodstuffs in Nutrition. Part V. Supplementary Values of the Proteins of *Eleusine coracana* (Ragi) and of certain pulses and skimmed milk powder studied by the Nitrogen Balance and the Growth Method. *Ind. Journ. Med. Res.*, XXVI (1), pp. 107–112, (1938).

Ragi proteins when supplemented by those of pulses and skimmed milk powder are very well suited for adult nutrition in rats being slightly superior to those of rice given in similar circumstances. The proteins of ragi by themselves were found to allow very little growth in young rats, but when supplemented by those of pulses and skimmed milk powder support good growth. In this respect mixtures of ragi and other proteins were found to be of almost equal value to the corresponding mixtures containing rice.

M. S.

134. SWAMINATHAN, M —The Relative Value of the Proteins of certain Foodstuffs in Nutrition. Part VI. General Conclusions. *Ind. Journ. Med. Res.*, XXVI (1), pp. 113–118, (1938).

The biological value and the digestibility coefficients of the proteins of 27 common Indian foods, including 6 cereals, 9 pulses, and 4 nuts and oilseeds, 7 vegetables and skimmed milk powder and the supplementary relations between the proteins of rice and ragi and other foods have been investigated. Though the proteins of a mixed diet of vegetable origin are of fairly high biological value for 'maintenance' of nitrogenous equilibrium in adult rats, small amounts of animal proteins (e.g. milk proteins) are probably necessary for satisfactory growth in young rats.

M. S.

135. WILSON, H. ELLIS C. and MITRA, DURGA DAS—A diet and physique survey in Assam, rural Bengal, and Calcutta. *Ind. Journ. Med. Res.*, XXVI (1), pp. 131–154, 2 figs., (1938).

The survey has been carried out among industrial workers in Assam, agriculturists in rural Bengal and some well-to-do families in Calcutta. The diet of the well-to-do appears to approximate to European standards, that of the Assam workers is poor in total calories, total and animal protein, total and animal fat, and total mineral. The position of rural Bengal comes midway. As regards heights and weights of the children, the well-to-do class again comes first, and rural Bengal next. The actual rate of growth, however, expressed as a percentage increase in body-weight per year and the dynamometer grip per lb. body-weight (age neglected) are greater in the Assam than the Calcutta children. A certain percentage of the Assam children had Xerophthalmia and Bitot's spots with a carotene plus vitamin A intake of 1000 per c.u. It is likely that the figure is near the threshold value for the appearance of signs of vitamin A deficiency.

D. D. M.

MALARIOLOGY.

136. AFRIDI, M. K.—Observations on Extra-Abdominal Spleen in Monkeys infected with *P. cynomolgi* and *P. knowlesi*. *Journ. Mal. Inst. Ind.*, I (4), pp. 355–389, (1938).

Untreated infections in four *S. rhesus* monkeys infected with *P. cynomolgi* and four with *P. knowlesi* were studied. The spleen was brought out of the abdominal cavity and stitched under the skin. Daily variations in the size of the spleen were noted as well as the total number of parasites per 10,000 red cells in the peripheral and splenic blood. The percentages of the various developmental stages of the parasite were also determined.

The maximum degree of splenomegaly in monkeys infected with *P. cynomolgi* occurred one to four days after the maximum parasitaemia. During the parasitic relapses a fair degree of enlargement of the spleen was noticed even though the parasite count remained very low.

In monkeys infected with *P. knowlesi* the rate of enlargement was rapid at the commencement of infection but became less marked at the approach of the peak of infection when actual diminution occurred in one monkey.

The differential parasite count in *P. cynomolgi* indicated considerable disturbance in the periodicity of the parasitic cycle at the time of crisis.

In the early stages of *P. knowlesi* infections, the total parasite counts showed sudden and inexplicable numerical rise which was more than the number of merozoites per schizont could be expected to produce.

The variation in the total number of parasites and its developmental stages showed a lag of two hours between the splenic and the peripheral blood. There was no significant difference noticed in the proportion of infested reticulocytes and red cells infected with multiple parasites.

The spleen smears showed large numbers of extra-cellular parasites, the probable underlying factor being the degeneration of red cell. In *P. cynomolgi* infections, aberrant forms of schizonts appeared during the crisis. These were characteristically smaller in size than normal schizont and their nuclei showed irregular segmentation.

M. K. A.

137. **Afridi, M. K.**—Antimalarial Operations in Delhi. *Proc. Nat. Inst. Sci. India*, IV, pp. 201-202, (1938).

The author describes the chief causes of malaria incidence in Delhi and the measures enforced during 1937 to control the disease. The *permanent measures* have been directed chiefly towards eradicating breeding places caused through faulty storm-water drains, lack of adequate drainage of certain low-lying tracts, and over-irrigation in the area fed by the western Jumna canal. The *temporary measures* are concerned with the organisation of the antimalarial staff of the various municipalities, the provision of oil, paris-green and other larvicides, and the institution of programmes for adequate weeding, minor filling and draining of small temporary collections of water. These measures have yielded very encouraging results.

B. M.

138. **Afridi, M. K.** and **Abdul Majid, S.**—Observations on the range of dispersion of *Culex fatigans* and its infiltration into the Delhi urban area. *Journ. Mal. Inst. Ind.*, I, pp. 155–167, (1938).

To substantiate the observations of Covell an intensive investigation about the possibility of culicine breeding in the sewage farm of Delhi was made in 1937. It was found that the sewage farm of Delhi was the chief source of mosquito nuisance of the city. The effects of temperature and humidity on the dispersion and infiltration of mosquitoes are also discussed.

M. A.

139. **Afridi, M. K., Abdul Majid, S.** and **Singh, J.**—Malaria in Kutch State. *Journ. Mal. Inst. Ind.*, I, pp. 187–209, (1938).

Investigations into the incidence of malaria in Bhuj and Mandvi Talukas were carried out in January and September, 1937. Malaria was not found to be generally prevalent in the State but localised areas occurred where the incidence was high. *A. stephensi* was the only species found infected. The favourite breeding places of this species were troughs, siphons, reservoirs, and wells in Vijaya Vilas palace; while in Bhuj it was exclusively a well-breeder. An outline of the antimalarial measures necessary for the control of malaria in Kutch State is given.

M. A.

140. **Afridi, M. K.** and **Majid, S. A.**—Malaria in Bahrein Islands (Persian Gulf). *Journ. Mal. Inst. Ind.*, I (4), pp. 427–472, (1938).

Bahrein Islands situated in a V-shaped gulf of the Arabian Coast were surveyed in January and May 1938. The most important malariogenic feature of the islands was the belt of palm grove cultivations along the coastal tracts.

The seasons are those of a temperate zone, *viz.*, a rainless summer and a wet winter. The summer months are, however, characterised by excessive heat combined with high humidity especially during July, August and September.

Malaria prevails in severe form in May, June and to a lesser extent in October and November. The disease was not uniformly severe in all localities, proximity to gardens determining its higher incidence.

Mosquito breeding in the garden area varied with the type of irrigation in use, spring and artesian well irrigation being more frequently associated with anophelism. The chief factors in causing mosquito production were excessive irrigation and inadequate drainage. The domestic sources of breeding were confined to *shallow wells and standing water* in the private gardens.

Of the anophelines encountered *A. stephensi* was the only species found infected in nature. This was the predominant species prevalent in the larval and the adult forms, and is responsible for malaria in Bahrein.

The prevalence of *A. stephensi* larvae was related to the salinity of water in the breeding grounds, the upper limit being 2,750 parts of chlorine per 100,000. The adult *A. stephensi* were found resting in houses situated close to the breeding places but there was evidence of daily incursions up to a distance of one and a half to two miles.

Recommendations regarding the permanent measures for the control of malaria concerned chiefly the relief for waterlogging in the gardens for which vertical drainage was considered as the method of choice. Temporary measures of control centered on the use of paris green and the local larvivorous fish *Aphanius* (*Lebias*) *dispar* (Rüppell).

M. K. A.

141. BANERJEA, A. C.—Urban Malaria in the United Provinces. *Proc. Nat. Inst. Sci. India*, IV, pp. 177–180, (1938).

Urban malaria in the United Provinces is generally of an endemic nature and regional epidemics of malaria which occur in the Punjab periodically are practically unknown. There is, however, the usual rise of spring malaria in the endemic cities from March to May when the most prevalent species of parasite is *P. vivax*. During the autumn months from September to November there is a more marked rise in malaria when *P. falciparum* is the predominant species. The distribution of quartan parasites is strictly limited. The principal anopheline mosquitoes found in urban areas are: *A. culicifacies*, *A. annularis*, *A. pallidus*, *A. splendidus*, *A. barbirostris*, *A. fluviatilis*, and *A. subpictus*. Of these *A. culicifacies*, which principally breeds in irrigation channels, river edges, 'kuccha' drains, borrow-pits and tanks, and *A. stephensi*, which chiefly breeds in wells, are the mosquitoes which have been frequently reported as responsible for transmission of malaria in urban areas.

Urban malaria may be due either to (i) natural causes or (ii) man-made. A study of the problems involved reveals that the incidence of urban malaria may be largely reduced by adopting sound sanitary measures and by developing co-ordination of activities between different departments concerned for urban sanitation such as Municipal Board, District Board, Cantonment and Railway area, the notified areas, the Improvement Trust, etc., and the co-operation of the public. Suitable anti-malarial bye-laws should be made and vigorously enforced to achieve any result.

B. M.

142. BARBER, M. A. and RICE, J. B.—Malaria in Poona and in its vicinity. *Journ. Mal. Inst. Ind.*, I, pp. 37–53, (1938).

A survey of malaria in the urban area of Poona and in certain rural areas adjoining it was made. Malaria indices in the urban area were generally low. Higher indices were found in rural regions where there was irrigation by canals or streams. Mosquito surveys showed that *A. culicifacies* was the chief vector of malaria. It was the only species in which malaria parasites were found and one of the three (*culicifacies*, *subpictus*, and *fluviatilis*) in which stomach blood was found human positive by the precipitation test. *A. subpictus* showed only one such positive during the entire survey. *A. fluviatilis* gave relatively high human positive percentage among the comparatively few examined and this species might be an efficient vector in those parts where it was abundant. Sixteen localities chiefly situated in the more malarious regions were twice surveyed, once before the advent of the monsoon and again in the early period of the rains. It was found that the abrupt change of weather was mainly responsible for a significant increase in the activity of the parasites.

M. A.

143. Basu, B. C.—Studies on a malarial infection in a Paddy bird. *Journ. Mal. Inst. Ind.*, I (3), pp. 273–284, 1 plate, 1 text-figure, (1938).

Plasmodium heroni, a new species of avian malaria, is described from a Paddy bird (*Ardeola grayi*). The infection is transmitted from one Paddy bird to another by blood inoculation. Sparrows, crows, domestic fowls and canaries are not susceptible to this infection. The disease is of considerable severity, the mortality being 66 per cent under experimental conditions. After an average incubation period of 7·4 days (varying from 2 to 20 days) the plasmodia appear in the peripheral blood, multiply rapidly, are present for 2 to 16 days (average 7·31 days), and then disappear. There was no relapse in any case. The majority of the birds which recovered from infection developed a solid immunity. Eight mature wild birds were found to be refractory to inoculation. A number of young birds were found infected in nature. During the height of the infection the internal viscera swarm with the parasite, but these disappear simultaneously with the disappearance of the parasite from the peripheral blood. The disease is not accompanied by pyrexia. Regarding the transmission of the disease, *Anopheles stephensi*, *A. subpictus*, *A. annularis* and *Aedes aegypti* are not susceptible to infection with this species of plasmodium. The parasite has been observed to develop up to the oocyst stage in the gut of *Culex fatigans*. Previous records of plasmodia of birds are discussed.

B. C. B.

144. Chopra, R. N. and Basu, B. C.—Studies on the effect of antimalarial drugs upon the infectivity of patients to mosquitoes. Part II. 'Cilional'. *Journ. Mal. Inst. Ind.*, I (4), pp. 351–359, table I, (1938).

In continuation of previous work the authors undertook to investigate the effect of 'cilional', a new synthetic antimalarial remedy, upon the infectivity of the patients to mosquitoes, and the results of the investigation are embodied in this paper. Contrary to the claims put forward by the manufacturers 'cilional' did not prevent the development of crescents in *A. stephensi*, fed on patients under treatment with cilional 0·02 gm. and atebrin 0·1 gm. three times a day for five days. The work is being continued.

R. N. C.

145. Chopra, R. N., Das Gupta, B. M. and Sen, B.—Studies on the action of synthetic antimalarial drugs on Indian strains of malaria. *Ind. Med. Gaz.*, LXXIII, pp. 667–669, (1938).

The writers have used 'cilional' in a number of cases of malaria and have found a total dose of 0·35 to 0·4 gm., three times a day, usually sufficient to eradicate practically all gametocytes from the blood without causing any ill-effects. While comparing cilional with plasmochin they are of opinion that when the latter drug was given in smaller doses than that prescribed by the manufacturers, crescents were eradicated in a short time, but no toxic manifestations were seen although five hundred cases were tried.

B. M.

146. Chopra, R. N.—Present position of Anti-malarial Drug Therapy in India. *Proc. Nat. Inst. Sci. India*, IV, pp. 145–156, (1938).

The author has discussed the present position with regard to the treatment of malaria by the cinchona derivatives and other anti-malarial remedies including synthetic drugs, such as atebrin, plasmochin, etc. After reviewing the various viewpoints about the anti-malarial properties of the cinchona alkaloids and synthetic drugs, the author refers to his own experimental work on ape malaria with *P. knowlesi* infection. The author agrees with the Malaria Commission of the League of Nations in maintaining that *therapia magna sterilisans* cannot be effected by either of the two groups of remedies. Cinchona alkaloids are almost non-toxic and suitable for mass treatment whereas the synthetic remedies have to be administered under medical supervision. The synthetic drugs are to be regarded as additional weapons in the hands of medical men for use in particular circumstances. Cinchona alkaloids would, according to the author, hold the ground in mass treatment of malaria in India for many years to come, and therefore cultivation of Cinchona on a wider scale should be encouraged in this country.

B. M.

147. **Chopra, R. N., Das Gupta, B. M. and Sen, B.**—Experimental studies on Ape Malaria with reference to its use in Malaria Therapy for nervous conditions. *Proc. Nat. Inst. Sci. India*, IV, pp. 165–169, (1938).

The authors record their experience on the transmission of monkey malaria to human beings for the treatment of nervo syphilis. They find that *P. knowlesi* is suitable for the treatment of aged and debilitated individuals owing to the mild nature of the symptoms it produces. A fairly large percentage of cases of infection with *P. knowlesi* has a tendency to spontaneous recovery, the parasites disappearing from the blood and the fever subsiding in a week or so. This mildness of symptoms renders *P. knowlesi* not quite as effective a therapeutic agent as human malaria. Previous infection with human malaria produces a marked degree of tolerance to infection with *P. knowlesi*. Thus, in localities where malaria is prevalent, *P. knowlesi* does not appear suitable for therapeutic purposes. When it is desired to give more than one course of fever to a patient, monkey malaria is of no use, inasmuch as one attack with this parasite seems to confer absolute immunity against a homologous strain of the same parasite. However, neither form of malaria (of human or monkey origin) seems to produce any significant beneficial effect on the patient's nerve conditions.

B. M.

148. **Covell, G., Mulligan, H. W. and Afridi, M. K.**—An attempt to control malaria by the destruction of adult mosquitoes with insecticidal sprays. *Journ. Mal. Inst. Ind.*, I, pp. 105–113, (1938).

The results of antimalarial measures of spraying dwelling houses with insecticides carried out in Delhi in 1936 are discussed. This method has been considered to be of great value in India, especially in the case of isolated communities where anti-larval measures are impracticable and where the vector species of anopheline rests in dwelling places in the day-time.

G. C.

149. **Curry, T. A.**—Flood-flush schemes in Bengal. *Proc. Nat. Inst. Sci. India*, IV, pp. 215–218, (1938).

The author has tried to show by facts and figures that flood-flushing or the introduction of flood water on to land for the sanitary improvement of the area flushed, as well as for the revitalising of the land and the irrigation of the crops grown thereon, is likely to bring about not only a reduction of malaria incidence in Bengal but will also improve the soil fertility. Experiments in certain sections of the Damodar river have given very encouraging results and the same method may be tried in the area of land between the lower reaches of the rivers Damodar and Hooghly where unhealthy conditions prevail and where the productivity of the soil is now much less than in former days.

B. M.

150. **Das Gupta, B. M.**—Transmission of *P. inui* to man. *Proc. Nat. Inst. Sci. India*, IV, pp. 241–244, (1938).

P. inui, a quartan parasite occurring as a natural infection in *S. irus*, has been successfully transmitted to a human volunteer in whose blood the parasites appeared 23 days after inoculation and in which the infection persisted for one week. The number of parasites observed in the blood of the volunteer was never high and recovery was spontaneous. Febrile symptoms were observed for three days only. The parasites encountered were rings, trophozoites, and schizonts. Gametocytes were never encountered.

B. M.

151. **Das Gupta, B. M. and Chopra, R. N.**—Studies on the action of synthetic drugs on simian malaria—Sulphonamide derivatives. *Ind. Med. Gaz.*, LXXIII, pp. 665–667, (1938).

Prontosil, a drug of the sulphonamide group, was tried on monkeys (*Silenus rhesus*) inoculated with *P. knowlesi*. It was found that only a heavy dose of about 3 c.cm. of the drug had a definite action on the plasmodium infection (at least in monkey) but it did not possess any advantage over other current anti-malarial remedies.

B. M.

152. De, M. N.—Pathology of Malarial Spleen. *Proc. Nat. Inst. Sci. India*, IV, pp. 195–199, (1938).

The author has discussed the pathology of splenomegaly with particular reference to the splenic enlargements seen in acute and chronic malaria. In *acute* malaria due to *P. falciparum* infection, the spleen is found to be only moderately enlarged. The organ as a whole feels very much distended, its capsule is very tense and it has an intensely dark slaty colour. Such a stretching and thinning of the capsule in acute malarial infection would explain the occurrence of rupture of the spleen either spontaneously or as a result of trauma. Smear examination from autopsy material reveals very few malaria parasites, though large phagocytic *mono*nuclear cells laden with hemozoin pigment are found in abundance. The splenic enlargement is entirely due, according to the author, to the extra burden suddenly thrown on the organ and to the concomitant vascular changes which inevitably follows such increased output of work.

In *chronic* malaria, the changes are essentially of the same nature as in the case of acute malaria but the capsule, trabeculae, etc., of the spleen become thickened and more numerous. The enlargement is always very much more than that in acute infections but contrary to the usual conception it never assumes an unusually big proportion. The enlargement, however, is of a more or less permanent character and is not easily amenable to treatment.

Malarial splenomegaly is always accompanied by varying degrees of hepatic enlargement due to the accumulation of pigments in the Kupffer's cells and marked engorgement of the liver capillaries. This engorgement however never leads to a cirrhosis of the liver.

B. M.

153. Dogra, J. R.—A malaria survey of Bannu Cantonment (1932-33). *Journ. Mal. Inst. Ind.*, I, pp. 57–81, (1938).

A malaria survey of Bannu cantonment carried out in 1932 and 1933 is described. The cantonment and its neighbourhood are traversed by innumerable irrigation channels which have become the main sources of mosquito breeding. The common species of anophelines found were *A. stephensi*, *A. culicifacies* and *A. subpictus*. The antimalarial measures which are adopted in the Bannu cantonment and in the city and the neighbouring villages are discussed.

M. A.

154. Griffin, J. C.—Surface and Subsoil drainage. *Proc. Nat. Inst. Sci. India*, IV, pp. 219–222, (1938).

The advantages of surface and subsoil drainage as an anti-malaria measure in Bengal have been discussed. Various methods of effecting drainage with special reference to their economics have been considered and suggestions as to the best course to adopt under the special circumstances indicated. In the deltaic area, the land near the river-bank is above flood level, while further away from the river it is below flood level. There is a 'natural' line—roughly a certain distance from it, such that, between the line and the river the policy of land raising and natural surface drainage should be pursued. Within that area excavations should be discouraged. On the other side of the line, the digging of tanks, excavations for brickworks, and other works to provide earth for filling purposes, may be allowed—for, during the flood season, the low ground will become one sheet of water and there will be no mosquito-breeding edge.

B. M.

155. Hora, S. L., and Nair, K. K.—Observations on the nutrition of *Panchax panchax* (Hamilton). *Proc. Nat. Inst. Sci. India*, IV, pp. 245–251, (1938).

Sen [*Current Science*, *5*, p. 357, (1937)] has shown from a study of the contents of the alimentary canal of a large number of specimens collected from several localities in the Ballygunge, Tollygunge, Howrah and Palta Waterworks areas that *Panchax panchax* under natural conditions feed on almost anything, irrespective of whether these are malaria parasites or not. The authors, while agreeing with the general findings of Sen, believe that *Panchax* prefers to feed on mosquito larvae, and only when their supply is exhausted, they begin to feed on other animals, mostly insects and especially ants. These results are confirmed by the authors by laboratory experiments, in which the fish are given a mixed diet of mosquito larvae and other types of animals such as chironomid larvae, corixiid bugs, may-fly nymphs, water-mites, beetles, etc. It is also observed that, when kept with algae, the fish preferred to starve rather than to feed on vegetable matter. *Panchax* is therefore a very effective larvicidal fish and its use, under Indian conditions, is strongly recommended.

B. M.

156. IYENGAR, M. O. T.—Topography of land in relation to malaria. *Proc. Nat. Inst. Sci. India*, IV, pp. 181–184, (1938).

The author has studied the selective habitats and distribution of the different species of the anopheline fauna which are found in Bengal in relation to the topography of land. These studies have shown that in most cases the operations of man are largely responsible for the increased facilities for the breeding of the harmful species of *Anopheles* due to interference with natural conditions, without due precautions being taken against the natural consequences of such interferences. In the virgin state, it is probable that the incidence of malaria was comparatively low. The occurrence of malaria in the sub-montane regions is probably largely due to the extensive forest clearance operations for the purpose of tea and rice cultivation. The clearance of the forests have eliminated the harmless species of *Anopheles* and have offered facilities for the intensive breeding of the harmful species. In the pastural region with little or no malaria, the localised foci are the results of attempts to alter the natural conditions as for example, creating terraced plots for rice cultivation, colliery operations, impounding of rivers and the digging of wells for water supply. In the deltaic area, the construction of embankments to prevent the flooding of the land by rivers in flood or by the tides largely contribute to the establishment of endemic conditions. In the estuarine area, the clearing of the forests and the prevention of the tidal flushing are responsible for the establishment of malaria endemicity through intensive breeding of *A. ludlowi.*

B. M.

157. IYENGAR, M. O. T.—Natural parasites of mosquitoes in India. *Proc. Nat. Inst. Sci. India*, IV, pp. 237–239, (1938).

Although various types of parasites infesting malaria larvae have been described in the literature, three groups belonging to the genus (1) Coelomomyces, (2) Microsporidia, and (3) Mermithidae, constitute, in the opinion of the author, the parasites that play a significant rôle in the natural control of mosquitoes in India. Our knowledge of these different parasites are meagre and unless more is known about their distribution, incidence, life-history and ecology, it cannot be utilised for a biological control of mosquitoes.

B. M.

158. KRISHNAN, K. V.—Biochemical changes in the blood of monkeys developing malarial haemoglobinuria and their significance in the etiology and treatment of human blackwater fever. *Proc. Nat. Inst. Sci. India*, IV, pp. 157–160, (1938).

Detailed investigations on the biochemical changes taking place in the blood of haemoglobinuric and non-haemoglobinuric monkeys during the different stages of experimentally induced blackwater fever have shown that during the pre-haemoglobinuric stage the following changes are conspicuous: (*a*) a fall in glucose and a rise in inorganic phosphorus; (*b*) a rise in cholesterol esters, and a fall in total cholesterol in a fair number of cases and a marked fall in free cholesterol in all cases; and (*c*) a rise in organic phosphorus. The interpretation and significance of these variations are discussed and a method of prevention and treatment of human blackwater fever based on these animal experiments has been outlined. Whatever be the true nature of the hemolysin, the author is of opinion that its action is definitely inhibited by the excess of free cholesterol and that treatment should be directed towards achieving this objective by the injections of glucose, ascorbic acid and cortin.

B. M.

159. KRISHNAN, K. V.—Spleen and Resistance to Malaria and Haemoglobinuria. *Proc. Nat. Inst. Sci. India*, IV, pp. 191–193, (1938).

Investigations were conducted on the rôle of the spleen in resistance to *P. knowlesi* infection in monkeys chiefly through splenectomy, which is a recognised method of experimental study. In order to understand the significance of the results correctly and for purposes of comparison the effect of splenectomy on the course of *L. donovani* infection in monkeys and mice was also studied. The results show that, while splenectomy in monkeys intensifies markedly the course of *P. knowlesi* infection and destroys completely both natural and acquired resistance, it has little or no influence on the course of *Leishmania* infection in monkeys or mice. It is concluded that the presence of the spleen plays a part of great importance in the resistance to malaria but its relationship to *Leishmania* infection is not clearly understood.

B. M.

160. LAL, R. B.—Forecasting Epedemics of Malaria. *Proc. Nat. Inst. Sci. India*, IV, pp. 171–175, (1938).

The author discusses the various principles and methods involved in forecasting malaria epidemics in the Punjab and makes a critical estimate of their probable values to the public health worker and sanitarian. The forecast for a province should be based on the following factors: (1) the spleen rate of school children taken all over the province in the month of June, (2) rainfall, (3) economic condition, (4) epidemic figure for each thana or town, (5) epidemic potential factor, (6) coefficient of correlation between rainfall and fever deaths for the month of October for the districts. In addition to the above, personal experience of the conditions obtaining in the province not displayed by these data is an important factor in the preparation of a good forecast.

B. M.

161. MILFORD RICE, E. and DATTA RAY, B. K.—A rapid method for the estimation of the arsenious oxide content of Paris Green. *Journ. Mal. Inst. Ind.*, I, pp. 123–128, (1938).

A simple and rapid method of analysing samples of paris green is described and the apparatus and reagents required are listed. The results of ten analyses of one sample examined by the rapid method are given with the corresponding results obtained by the standard method. An average error of 0·4 per cent is shown.

M. A.

162. RAO, B. A.—Control of Anopheline breeding in irrigation channels by Paris-Green. *Proc. Nat. Inst. Sci. India*, IV, pp. 203–209, (1938).

In the light of studies over a period of eight years in the Nagenhalli area, the author has come to the conclusion that:—

(1) Paris-green can be effectively used for controlling anopheline breeding in irrigation channels.
(2) One of the objections to the use of paris-green as a larvicide in anti-malaria work has been that, judged by the standard of larval catches, it is not one hundred per cent lethal, but this objection is more apparent than real and need not stand in the way of anti-larval operations with paris-green.
(3) A one per cent mixture with a suitable inert diluent is quite adequate strength for use as a larvicide.

R. C. G.

163. RAO, B. A., SWEET, W. C. and SUBBA RAO, A. M.—Ova measurements of *A. Stephensi* type and *A. Stephensi* var. *Mysorensis*. *Journ. Mal. Inst. Ind.*, I, pp. 261–266, (1938).

Average measurements of eggs of *A. Stephensi* type and *A. Stephensi* var. *Mysorensis* are given. Laboratory breeding of *A. Stephensi* from larva and mating them in the laboratory did not show any change in the average ova measurements, but this was not the case in *Mysorensis* variety. The utility of *A. Stephensi* type as a colony mosquito is noted.

M. A.

164. ROY, D. N.—A Note on Shute's Technique of Enumerating Sporozoites in an Emulsion of Salivary Glands. *Journ. Mal. Inst. Ind.*, I (3), pp. 335–337, (1938).

Shute in 1937 described a technique whereby he thought it would be possible to inoculate known numbers of sporozoites. The author has ascertained the correctness of

Shute's findings and reports that there is a great tendency for the sporozoites to adhere to the surface of glass and therefore, when they leave the syringe at the time of inoculation, the emulsion will lose its strength to a considerable extent.

D. N. R.

165. **Roy, D. N., Chandra, S. N. and Siddons, L. B.**—On the presence of a zoophilic race of *A. stephensi* in Calcutta. *Journ. Mal. Inst. Ind.* I (4), pp. 417–426, (1938).

Calcutta apparently provides an instance of 'Anophelism without malaria'. An opportunity was recently provided of throwing fresh light on the problem of the association of *stephensi* with malaria by the examination of 265 specimens of blood-fed *stephensi* captured in a house in Calcutta during May, June and July. The precipitin test of 172 females showed an androphilic rate of 3·4 per cent and a zoophilic rate of 96·6 per cent. The condition of the ovaries in 207 females was also noted: 64 had mature ovaries, 94 had immature ovaries and 49 were undeveloped. Bionomical observations suggest that *stephensi* usually visits houses or cattle-sheds in search of food late at night or early in the morning. Sweet and Rao (1937) concluded that there were two types of *stephensi* differing in egg morphology. In the light of the above findings it is discussed whether the two types of *stephensi* differ in potentiality as carriers of malarial parasites in nature, as Sweet and Rao have suggested. A hypothetical infective rate of 0·09 per cent is deduced for *A. stephensi* on the basis of a comparison with figures relating to *A. minimus* and other species.

D. N. R.

166. **Russell, Paul F.**—Malaria due to defective and untidy irrigation. A preliminary discussion. *Journ. Mal. Inst. Ind.*, I (4), pp. 339–349, 22 figs., (1938).

It is not irrigation *per se*, but defective and untidy irrigation which, by misplacing water to the advantage of certain anopheline mosquitoes, such as *A. culicifacies*, generates malaria. Irrigation projects which fail to provide proper drainage are followed by rising subsoil water levels, resulting in increased mosquito breeding and often in increased or new malaria. Such defects in an irrigation system as leaky sluice gates, seeping canal banks, borrow-pits, defective distribution chambers, immoderate supply and improper delivery of water, poorly maintained canal banks and beds, or absence of bridges may result in malaria through increased breeding of the anopheline vector. Other causes are, absence of a planned or controlled system of field channels, increased wet cultivation, more and shallower wells. Active, practical co-operation is required between malariologists and engineers.

P. F. R.

167. **Russell, P. F., Menon, M. K. and Rao, T. R.**—Epidemiology of malaria in Pattukkottai Taluk, Tanjore District, Madras Presidency, India. *Journ. Mal. Inst. Ind.*, I (3), pp. 285–326, 8 graphs, 1 fig., 1 map, (1938).

This paper reports 18 months' observations on the epidemiology of malaria in an area of south-eastern India where an extensive irrigation project was inaugurated in 1933-1934. The physical characters of the countryside and irrigation system, some social features, and notes about the anophelines are first presented. Then follow detailed analyses of over 4,500 spleen palpations and blood smear examinations, taken in 40 villages, with reference to age and sex, to various spleen and parasite indices and relationships, and to seasonal and geographical distribution. Finally, there are some conclusions and references.

The spleen and parasite indices were over 40 and over 30 per cent respectively. More than two-thirds of the infections were due to *P. falciparum* and less than 2 per cent to *P. malariae*. There was evidence from hospital returns, mosquito dissections, spleen and blood examinations and two infant surveys, of a well-marked 'malaria season' from July to January. Malaria in this area is transmitted chiefly by *A. culicifacies* breeding most commonly in irrigation water.

The authors conclude that malaria in this area is traceable to the effects of the newly introduced Mettur-Cauvery Irrigation Project.

P. F. R.

168. Sen, P.—*Anopheles Sundaicus* (*Ludlowi*) and Malaria in Calcutta. *Journ. Mal. Inst. Ind.*, I, pp. 83–97, (1938).

The details of an outbreak of malaria in the south-east part of Calcutta which occurred in 1936 are given. The neighbouring areas Dhapa (24-Pargannas) and Topsia (Tollygunge Municipality) were also heavily affected. The spleen and the parasite rates were worked out separately for each of the localities. In Dhapa the spleen rate was 90 per cent and in North Tangra (Ward 18) 52 per cent, whilst the parasite rate in thin blood films reached as high as 73 per cent in the former area. Widespread breeding of *Anopheles sundaicus* was recorded from the localities affected in Calcutta and the adjoining areas. The relative prevalence of the species is shown separately in different wards. The rate of infection was found to be 3·2 per cent.

M. A.

169. Sen, P.—On some physico-chemical and vegetation factors of the breeding places of *Anopheles sundaicus* Rodenw., *Journ. Mal. Inst. Ind.*, I (3), pp. 257–260, (1938).

The results of chemical analysis of the three factors, chlorides, hydrogen-ion concentration and carbonates of waters from actual breeding places of *Anopheles sundaicus* detected in Calcutta and its adjoining areas, the Salt Lake, indicated that the salinity of the waters varied from 634·0 to 16·0 with an average of 164·3 parts per 100,000. The species thus possesses a great tolerance to this factor which alone can no longer be depended upon in predicting its establishment in an area. The hydrogen-ion concentration of the breeding waters ranged between 7·7 and 8·5, the average obtained from the series of observations being 8·2, showing that the species prefers definitely alkaline waters. The carbonates varied irregularly, the average figure obtained was 13·4, the lowest recorded being 4·2 and the highest 19·2. The results obtained did not show any direct relationship between carbonate and pH factors. The cardinal condition for the breeding of the species, however, appeared to depend on the vegetation factor present in the waters concerned. It has been found that in the presence of a certain amount of salt concentration in an alkaline water, if floating algae such as Enteromorpha, Oscillatoria, Oedogonium and Lyngbia occur, or if there is Hydrilla in a water collection, the breeding of the species is practically ensured. The removal of aquatic vegetations from such water collections has been recommended as a control measure against this species.

P. S.

170. Sen, P.—*Anopheles Ludlowii* (*A. sundaicus*) survey in and around Calcutta. *Proc. Nat. Inst. Sci. India,* IV, pp. 229–235, (1938).

The *Anopheles sundaicus* (*ludlowii*) survey in and around Calcutta has been proceeding along two distinct lines, (1) the river-side areas including the places served by the rivers Hooghly, Bidyadhari, Ichhamati and the various channels leading from these, and (2) the Salt Lake areas to the east of the city including the fringe areas of Calcutta. Active dispersal of the species has been revealed in various areas along the river-side and to within a distance of 7 to 16 miles of the borders of Calcutta. In the Salt Lake area to the east of the city also, *sundaicus* invasion has more or less established itself. Starting from the extreme eastern border of the lake, the mosquito breeding grounds have now approached the environs of the city and heavy malarial incidence due to *sundaicus* infestation has already been recorded in several wards of Calcutta, *e.g.*, Dhapa, Topsia, Tangra, etc.

A. sundaicus is normally a brackishwater breeder but is gradually establishing itself in what may be considered as freshwater breeding places. The species is also migrating more and more towards human habitations year after year. This migration has been helped in many places through the agency of transport either by train, country-boat, or perhaps by bus as has been sufficiently indicated from the catches made at the different railway stations in and around Calcutta, as also from the lock-gates at the end of Calcutta's canal system. The heavy rainfall, large tracts of tidal areas with embanked portions of water, uniform soil condition and high temperature with heavy moisture contents have all been helpful in the distribution of the species.

B. M.

171. Senior White, R.—On malaria transmission in the Jeypore Hills. Part II. *Journ. Mal. Inst. Ind.*, I, pp. 129–145, (1938).

In the Jeypore hills, intensive studies by mosquito dissection method have showed that only *A. fluviatilis*, *A. varuna* and *A. minimus* are responsible for the transmission of malaria. *A. culicifacies* plays no part whatever in transmission. Oocyst counts for all gut infections in the vector species are given. The relationship of these findings to percentages of the species of parasites found in man and to the paucity of crescents in these hills is discussed.

M. A.

172. SENIOR WHITE, R. and DAS, B. K.—On malaria transmission in the Singhbhum Hills. *Journ. Mal. Inst. Ind.*, I, pp. 169–184, (1938).

Transmission of malaria in Singhbhum hills has been discussed. The three species of the *funestus* group (*fluviatilis*, *varuna* and *minimus*) are the only malaria vectors in the Singhbhum hills. Transmission of malaria has been found to occur in every month except May, June, and July. Anti-malarial measures are considered useful if started as soon as the rains commence.

R. S. W.

173. SENIOR WHITE, R.—Physical factors in Mosquito Ecology. *Proc. Nat. Inst. Sci. India*, IV, pp. 223–227, (1938).

The author has reviewed the whole position regarding the viability of mosquito larvae under various physical conditions of temperature, hydrogen-ion concentration, etc. It has been shown that saline ammonia in amounts of less than 1 p.p.m. is inhibitory to natural water breeders, especially anophelines. Williamson has further proved that it is not so much the water itself but the undergoing soil which determines whether malarial vectors do or do not breed in the water. Excess albuminoid nitrogen in the presence of deficient oxidation characterises non-malarial soil. Below a soil nitrogen content of 0·1%, malaria is to be expected from standing surface water: at levels much above 0·3%, stagnant, shallow waters are inimical to all anophelines. A high degree of nitrification, giving a high ratio of nitrate to ammoniacal nitrogen, indicates adequate oxidation and is incompatible with the breeding of malaria-carrying anophelines.

These findings tend to indicate that anti-malarial measures based on soil nitrification and manuring may hold out prospects which the ordinary chemical larvicidal measures have failed to achieve. If improvement of agricultural methods is adopted by increasing the proper nutrition of the soil, *e.g.*, cowdung manuring, etc., malaria will be eradicated and the poor agriculturists will also benefit immensely.

B. M.

174. SINHA, J. D.—Drug Prophylaxis in Malaria by the use of Quinine and Plasmochin in the field. *Proc. Nat. Inst. Sci. India*, IV, pp. 211–214, (1938).

The author gives an account of an experiment carried out during the period 1933–37 by the Bengal Public Health Dept. with a view to finding out how far it is possible to control malaria in a hyperendemic area by trying to prevent infection by *Anopheles* mosquitoes by destroying both the sexual and asexual forms of malaria parasites in the human body by a blanket method of treatment, *i.e.* simultaneous free administration of plasmochin within the selected area, followed by prompt treatment of all malaria cases as soon as they occur. The results have indicated that complete eradication of malaria by this scheme is *not possible*. It certainly reduces the incidence of malaria by curtailing the parasitic factor to a minimum but how long the incidence of malaria will remain low in the locality in the absence of continued efforts is not known. Anti-parasitic and anti-larval measures together appear to be best in the present state of our knowledge.

B. M.

175. SUBBA RAO, A. M., SWEET, W. C. and RAO, B. A.—Measurements of wings of two forms of *A. Stephensi*. *Journ. Mal. Inst. Ind.*, I, pp. 115–117, (1938).

Measurements of the greatest length and greatest breadth excluding fringe of the wings of two forms of *A. Stephensi* are reported. No significant difference in the mean measurements of the wings as represented by the relation of breadth to length could be found.

M. A.

176. SWEET, W. C. and RAO, B. A.—Measurement of *A. culicifacies* ova. *Journ. Mal. Inst. Ind.*, I, pp. 33–35, (1938).

Average measurements of length, greatest breadth, length of float, number of ridges on the float, and proportion of length covered by float were given for 1994 ova from 66 female *A. culicifacies* caught wild in five parts of India. In one of these places, *A. culicifacies* was not a malaria carrier. The egg measurements did not vary significantly and gave no indication of races of this species, as based on the measurements of ova.

M. A.

177. SWEET, W. C.—Irrigation and Malaria. *Proc. Nat. Inst. Sci. India*, IV, pp. 185–190, (1938).

The author has studied the malaria problem with special reference to irrigation projects in the Mysore State. There are three types of irrigation systems in Mysore State. One involves a small area under a local tank and is usually not malarious; a second covers a larger area under a bigger, more permanent tank and is frequently malarious. while the third is an extensive riverine system which is invariably malarious. The three types of irrigation seem to differ in (1) the length of main and subsidiary channels; (2) the amount of water used; (3) the season of the year in which water is available. In these three differences possibilities for the control of malaria exist. if special emphasis is laid on the strict control of the amount of water supplied and its use. Lack of drainage remains as a defect common to all types but this aspect of the prevention and control of malaria in new and existing irrigation systems is not likely to be tackled in this country properly in the near future, until the profit motive is largely removed from consideration.

B. M.

HELMINTHOLOGY, PROTOZOOLOGY AND MEDICAL ENTOMOLOGY.

178. DAS GUPTA, B. M.—Leptospirosis in India. *Ind. Med. Gaz.*, LXXIII, pp. 449–453, (1938).

Six cases of Leptospiral Jaundice were studied and the identity of the disease was established by laboratory examinations. The causal organism was found to belong to the classical serological group of *L. Icterohaemorrhagia* strain of Europe and differed from many Eastern strains. In a series of animal inoculations, one very young guinea pig showed leptospirae in the peritoneal fluid as early as the 2nd day of inoculation, although the blood of the animal was not positive till two days later. One hundred and sixty-three rats of Calcutta were examined for leptospiral infection but none showed positive results which proved that natural infection amongst the rat population of Calcutta is exceedingly rare.

B. M.

179. DUTTA CHOWDHURY, R. and CHATTERJEE, R.—Intestinal parasitism in children. *Ind. Journ. Pediat.*, V, pp. 212–217, (1938).

A detailed account of the infestation of two hundred children of the Chittaranjan Shishu Sadan with intestinal parasites from April 1936 to November 1937 is given. The incidence of parasitic infection was more common in the second half of the year, the youngest child harbouring parasites being 7 months old. The commonest parasite found was *Giardia Lamblia* and the next common was *Ascaris lumbricoides*. Trichomonas infection was abnormally high in comparison to the incidence in other countries.

R. D. C.

180. MAPLESTONE, P. A.—A new filarial worm from a human being. *Ind. Med. Gaz.*, LXXIII, pp. 8–10, (1938).

The author has described the occurrence of a new type of female filarial worm in the eye. This worm has close morphological affinities with *L. Loa*. Owing to the absence of the male, the genus of this worm has not been definitely ascertained.

B. M.

181. **Menon, M. A. U.**—The egg of *Ficalbia* (*Mimomyia*) *Hybrida Leicastèr. Journ. Mal. Inst. Ind.*, I, pp. 185-186, (1938).

The egg of *Ficalbia* (*Mymomyia*) *hybrida Leicaster*, which was hitherto unknown, has been described. This species is the nearest approach among culicines to the *Anopheles* type of egg, and is the only culicine in which the egg has a frill. The larva and pupa of this mosquito are adapted to obtain their supply of oxygen from the air cavities in the roots of the water plant *Pistia Stratiotes*.

M. A. U. M.

182. **Rishworth, H. R.**—Adult filarial worm of unknown species removed from the skin of a human subject. *Ind. Med. Gaz.*, LXXIII, pp. 7-8, (1938).

The author has described the occurrence of a filaria in the skin which so far has been considered an unusual situation for lodgment of filaria. A red nodular swelling in the skin preceded by a patch of erythema and irritation was the outstanding clinical feature of this condition.

B. M.

183. **Sinton, J. A.**—The successful transmission of cutaneous leishmaniasis by inoculation to man from a natural lesion occurring on a dog in India. *Ind. Journ. Med. Res.*, XXV (3), pp. 787–789, (1938).

Infected material from a natural lesion occurring on the nose of a dog in India was inoculated by cutaneous scarification into a monkey (*S. rhesus*) and into two human volunteers. No infection was detected in the monkey, nor in an Indian volunteer, who had previously had an Oriental sore in youth. After an incubation period of over 12 months, the European volunteer developed a small lesion at the site of inoculation. Leishmania could be demonstrated both in smears and cultures for 16 months after the first appearance of the lesion. It healed spontaneously after 20 months. At the end of 14 months the infection was transmitted to another European volunteer, and a lesion showing Leishmania appeared after an incubation period of 5 months only.

J. A. S.

184. **Syddiq, M. M.**—*Sphunculina Funicala* (Eye fly). *Ind. Med. Gaz.*, LXXIII, pp. 17–19, (1938).

The life-history and the pathogenesis of the eye fly which abound in Hyderabad has been described by the author.

B. M.

185. **Theodor, O.**—On sandflies (*Phlebotomus*) from Ceylon, Siam, and Malay. *Ind. Journ. Med. Res.*, XXVI (1), pp. 261–270, (1938).

The description of *Phlebotomus zeylanicus* is completed in several important details. The hitherto unknown female of *P. arboris* is differentiated from that of *P. zeylanicus* with which it was confused. *P. babu* var. *insularis* is described. *P. iyengari* var. *malayensis* var. nov. is described and the relationship between *P. iyengari* and *P. hivernus* is discussed. The latter species is considered a variety of *P. iyengari*. Notes on several other Indian species of *Phlebotomus* are given.

O. T.

SNAKE VENOMS.

186. **Chowhan, J. S.** and **Chopra, R. N.**—Use of Cobra Venom in nerve leprosy. *Ind. Med. Gaz.*, LXXIII, pp. 720–724, (1938).

Injections of cobra venom given intradermally or intramuscularly in and around the nerve supply resulted in relief of pain in the neural type of leprosy in a large number of cases. In some cases which were resistent to cobra venom alone, vitamin B complex was effectively combined with the venom for the relief of neuritis. The nature of action of the venom is not clearly understood. The cobra venom may possibly act by virtue of its choline esterase content or a substance of this nature which neutralises excess of acetylcholine in tissues produced by pathological over-stimulation of the nerves. In higher concentration (1 in 20,000), cobra venom can effect destruction of newly formed tissues when injected locally. If the venom can reach the tuberculoid in similar concentration, it might help to dissolve them and in this way a cure may be possible.

B. M.

187. Ghosh, B. N. and Chowdhury, D. K.—Enzymes in snake venom. Part IV. *Journ. Ind. Chem. Soc.*, XV, p. 566, (1938).

The critical inactivation temperatures of the proteolytic enzyme in the venom of cobra (*Naja naja*), banded krait (*B. fasciatas*), *Echis carinata*, and *Vipera Russelli* have been determined and are found to be 55°, 53°, 55° and 62°C respectively. The critical inactivation temperature of trypsin mixed with heated cobra venom is 60°C. It has therefore been suggested that the proteolytic enzyme in snake venom is probably identical with trypsin.

R. C. G.

188. Ghosh, B. N. and De, S. S.—Investigation on the isolation of the Neurotoxin and Haemolysin of cobra (*Naja naja*) venom. *Ind. Journ. Med. Res.*, XXV (3), pp. 779–786. (1938).

A very active sample of cobra (*Naja naja*) neurotoxin free from haemolysin has been prepared by fractional precipitation with sodium sulphate, followed by adsorption on and elution from tungstic acid, surface dialysis and finally by cataphoresis. For the same nitrogen content the sample was 17 times more toxic than the dried crude cobra venom. The iso-electric point of the purified neurotoxin appears to be above pH 9·4. The haemolysin of cobra (*Naja naja*) venom has been separated from the neurotoxin by precipitation with sodium chloride and then further purified from the greater portion of the other proteins by coagulating them at 86°C from a faintly alkaline solution and finally by the cataphoresis of the solution obtained after heat coagulation. For the same nitrogen content the haemolysin fraction, so purified, is four times more active than the crude venom.

B. N. G.

189. Iyengar, N. K., Sehra, K. B. and Mukerji, B.—Studies on the Protease of cobra venom. *Ind. Journ. Med. Res.*, XXVI (2), pp. 487–492, (1938).

The rate of proteolysis of casein solution (1%) by cobra venom (0·05%) has been studied by the estimation of non-protein nitrogen released at definite intervals. The optimum pH for the digestion is found to be in the neighbourhood of 8, and the amount of casein digested is proportional to the square root of the duration of digestion. In low concentrations, the enzyme is gradually inactivated during digestion and both HCN and KCN have a definite inhibitory effect on the enzyme. The proteolytic enzyme (protease) in the venom therefore appears to belong to the group of tryptases. The significance of the presence of the protease in the venom and its therapeutic implications are discussed.

N. K. I.

190. Iyengar, N. K., Sehra, K. B., Mukerji, B. and Chopra, R. N.—Choline Esterase in Cobra Venom. *Current Science*, VII, No. 2, pp. 51–53, 1938).

The authors have shown that cobra venom in the strength 0·005 per cent hydrolyses acetylcholine but not ethylbutyrate, and that eserine inhibits the reaction. This indicates that cobra venom contains choline esterase in fair amounts. Russell's viper venom is found to have no choline esterase activity. The authors suggest that the presence of choline esterase in the venom offers a probable explanation for the onset of muscular paralysis brought about by the venom. If the choline esterase destroys the acetylcholine liberated at the nerve-endings, nerve impulses cannot be transmitted. The central nervous system effect of the venom however cannot be explained on this theory.

B. M.

191. Roy, A. C.—Lipolytic activity of the venoms (Cobra and Russell's viper). *Ind. Journ. Med. Res.*, XXVI, pp. 249–258, (1938).

The capacity of the cobra and Russell's viper venom in splitting up (1) true fats, (2) esters, (3) lecithin, and (4) cholesterol esters were investigated. The results show that none of the venoms has any appreciable action upon neutral fats. Cobra venom has a fairly strong esterase activity as judged by its capacity to split up ethyl butyrate, but viper venom has no appreciable action upon it even in fairly concentrated solutions. This esterase activity and the haemolytic property however do not run parallel. Both the venoms act upon lecithin, splitting up fatty acids, but the viper venom appears to have somewhat stronger action. The venom-lecithinase is very stable and its activity is not appreciably diminished even by subjecting it to a boiling temperature for 15–20 minutes. None of the venoms could split up an emulsion of cholesteryl oleate but in the presence of cobra venom there was an appreciable lysis of the emulsion whereas with viper venom a flocculation of the emulsion was observed.

A. C. R.

192. ROY, A. C. and CHOPRA, R. N.—Some biochemical characteristics of snake venom. *Ind. Journ. Med. Res.*, XXVI (1), pp. 241–248, (1938).

Biochemical characteristics of cobra and Russell's viper venoms were studied in order to find out some clues for the explanation of some of the more important physiological actions manifested by them. The viper venom contains more of the albumin but less of the pseudoglobulin portion than that of cobra. Euglobulin is absent in the cobra venom but the viper venom contains it to the extent of 3·6%. None of the venoms contain any invertase or diastatic enzymes but they both possess the property of digesting fibrin, liquefying gelatin, clotting milk and also digesting casein. The viper venom appears to be more active than the cobra venom with respect to proteolytic action. The existence of a lecithin splitting enzyme in the venoms was investigated, but no definite conclusion on this point was arrived at. Regarding their haemolytic properties it was found that while cobra venom haemolysed the susceptible varieties of R.B.C. in varying degrees, the viper venom was non-haemolytic in the large majority of cases.

A. C. R.

ENZYMES.

193. ADLER, E., DAS, N. B., VON EULER, H. and HEYMAN, U.—Biological dehydrogenation and synthesis of glutamic acid. *Compt. rend. trav. Lab. Carlsberg*, XXII, pp. 15–24, (1938).

Glutamic acid apodehydrogenases from higher plants and animals differ from that obtained from yeasts in that they have co-enzyme specificity, and combine only with co-dehydrogenase I giving holodehydrogenase. Plant apodehydrogenase acts only on glutamic acid. Ketoglutaric acid inhibits the action just as for yeast dehydrogenase. Dialysis of the enzyme solution removes the activator. The latter is thermostable, stable to acid, unstable to alkali, destroyed by combustion, and the ash is completely inactive. NH_4 cannot replace the activator. It is not pptd. by Hg^{ii} acetate, $Ba(OH)_2$ picric or picrolonic acid, and only partly by Ag salts. Ethyl acetate does not extract it from aqueous solution. It is quantitatively adsorbed by Al_2O_3 and can be eluted with Na_2HPO_4 but not with aq. NH_3. It is not fermented by yeast, and the solution can be evaporated to dryness in vacuo. Liver, brain, and heart also contain glutamic acid apodehydrogenase, which acts only on glutamic acid. Extraction of acetone-dried brain with PO_4 buffer gives a crude solution which will act also on natural aspartic acid, but with much less vigour. The mechanism of glutamic acid dehydrogenation and synthesis is discussed.

B. M.

194. BHAGVAT, K.—Enzyme method for the estimation of adrenaline in suprarenal glands. *Ind. Journ. Med. Res.*, XXV, No. 4, p. 911–916, (1938).

An enzyme method for the estimation of adrenaline from dogs' fresh suprarenal glands is described. The method is based on the oxidation of adrenaline by the enzyme to a red-coloured compound. It is found that the colour formation takes place between pH 4·4 and pH 7·6 and that the colour is more stable in the acid range. This method is rapid and is sensitive to 1: 500,000 concentration of adrenaline. The author finds that there is good agreement between the biological and enzyme methods but the chemical method is found to give variable results.

R. C. G.

195. **Chakrabarti, A. R.**—A study on enzymes with special reference to an amylase locally isolated. *Journ. Ind. Med. Assoc.*, VII, No. 6, pp. 350–357, (1938).

The author has given a general idea of the enzymes in relation to their chemical properties, extraction and purification, adsorption and other special properties. He has extracted and purified an amylolytic enzyme from a special type of fungus (*Aspergillus*) of local origin and has studied some of its properties.

R. C. G.

196. **Chatterjee, N. R., Ghosh, S.** and **Chopra, R. N.**—Studies on the enzymes of the seeds of *Butea frondosa*. Part I. Proteolytic enzyme. *Journ. Ind. Chem. Soc.*, XV, pp. 101-106, (1938).

The fresh seeds of *Butea frondosa* possess an anthelmintic action, especially against round worms (*Ascaris* species). The seeds, on examination, were found to contain proteolytic enzymes which hydrolyse peptones and casein, liquefy gelatin but have no action on egg-albumin or fibrin. They act best in a slightly alkaline medium and the optimum temperature is in the neighbourhood of 40°C. Hydrocyanic acid is found to have a definite activating influence. They behave like 'yeast trypsin' and appear to be a mixture of plant proteinase and polypeptidase.

R. C. G.

197. **Damodaran, M.** and **Anantanarayanan, P.**—Enzymic proteolysis. I. Liberation of ammonia from proteins. *Biochem. J.*, XXXII, pp. 1877–1889, (1938).

A study has been made of the progressive liberation of ammonia and of amino-groups during the action of pepsin, trypsin, erepsin and of papain on three typical proteins, casein, edestin and gliadin.

It is shown that amide and peptide hydrolyses do not by any means run parallel and that the ammonia formed is, at least in great part, not directly connected with proteolytic action but arises from the decomposition, and is not enzymic in nature but is brought about by the acidic or alkaline reactions of the digestion media.

In papain digestion, on the other hand, ammonia formation appears to be an enzymic function. Papain either possesses deamidase activity itself or contains a component which has such activity.

R. G.

198. **Damodaran, M.** and **Krishnan, P. S.**—Enzymic Proteolysis. II. The formation of free tyrosine in peptic digestion. *Biochem. J.*, XXXII, pp. 1919–1925, (1938).

The liberation of tyrosine during peptic digestion of casein has been quantitatively followed. It is shown that after 7 days' digestion about 6% of the total tyrosine and roughly the same proportion of the total N of the protein are in a form not precipitable by phosphotungstic acid.

From peptic digests of casein, carried out under conditions where bacterial contamination was completely excluded, tyrosine has been isolated in yields amounting to 1·7–1·8% of the total tyrosine in the protein.

The tyrosine produced by self-digestion of the enzyme forms but a small fraction of that obtained from the casein digest.

The action of acid in the concentration necessary for peptic digestion does not lead to the liberation of the free amino-acid from casein.

B. M.

199. **Damodaran, M.** and **Nair, K. R.**—Glutamic acid dehydrogenase from germinating seeds. *Biochem. J.*, XXXII, pp. 1064–1073, (1938).

A number of germinating seeds have been examined for the presence of amino-acid dehydrogenases. The only dehydrogenase found is one specific for glutamic acid which occurs in the seedings of *Phaseolus mungo, P. radiatus* and *Pisum sativum*.

The enzyme is readily obtained in aqueous extracts free from cellular material and can be concentrated by precipitation with ammonium sulphate and re-dissolving in phosphate buffer. In this condition it actively oxidises the naturally occurring glutamic acid, differing in this respect from deaminases from animal sources hitherto studied, which in cell free extracts act only on the optically non-natural isomerides of the amino-acids.

The enzyme belongs to the class of aerobic dehydrogenases, being capable of oxidising glutamic acid either in the presence of methylene blue or of molecular oxygen. Hydrogen peroxide formation has been demonstrated by the coupled oxidation of nitrite. Cyanide, arsenite and fluoride do not inhibit the enzyme nor is it activated by methylene blue, ascorbic acid, glutathione or dihydroxyphenylalanine.

The oxygen uptake corresponds to 1 atom of oxygen per molecule of glutamic acid. The end product of the oxidation is x-ketoglutaric acid, which has been isolated and identified as the 2: 4-dinitrophenyl hydrazone.

B. M.

200. DAMODARAN, M. and NARAYANAN, E. K.—Enzymic proteolysis. III. Hydrolysis of asparagine, asparagine peptides and anhydroglycylasparagine. *Biochem. J.*, XXXII, pp. 2105–2113, (1938).

1. The amide group in leucinamide, asparagine and glucinamide is hydrolysed by trypsin-free erepsin, the rate of hydrolysis decreasing with the three substrates in the order given.
2. Trypsin-free erepsin also hydrolyses the peptide group in chloroacetyl-asparagine, but not the amide group in either this or other asparagine-peptides examined.
3. Pepsin, erepsin-free trypsin and papain are without action upon the amide or peptide groups in glycinamide, leucinamide, asparagine, glycylasparagine or leucylasparagine.
4. Anhydroglycylasparagine (2: 5-diketopiperazine acetamide) is not affected by any of the animal proteases or by papain.
5. The bearing of these results on (i) the specificity of the proteolytic enzymes, and (ii) the 'amide' nitrogen of proteins is briefly discussed.

B. M.

201. DAS, N. B. and EULER, H. VON—Enzymic Dephosphorylation of Cozymase. *Nature*, CXLI, p. 604, (1938).

Nucleotidase (an enzyme which hydrolyses phosphoric esters) splits off the phosphate group from the molecule of cozymase (a coenzyme assisting the oxidation of carbohydrate), according to the authors. The dephosphorylation takes place more slowly than in the case of the adenylic and inosinic acids. Dihydrocozymase also is dephosphorylated about twice as fast as cozymase, and this is attributed by the authors to the dibasic character of the former.

R. G.

202. DAS, N. B., EULER, H. VON and ADLER, E.—Enzymic synthesis of glutamic acid. *Arkiv. Kemi. Min. Geol.*, XII, B., No. 40, p. 5, (1938).

A system containing ketoglutaric acid, NH_4Cl alcohol, cozymase, alcohol dehydrogenase (yeast), and glutamic dehydrogenase (liver) yields acetaldehyde and glutamic acid. The reversible formations of iminoglutaric acid (acetaldehyde) and dihydrodehydrogenase from glutamic acid (ethyl alcohol) and dehydrogenase appear to be coupled reactions, the significance of which in the animal organism is discussed.

R. G.

203. DAS, N. B.—Activator of alanine-dehydrogenase. *Naturwiss.*, XXVI, p. 168, (1938).

Kidney tissue and top yeast contain a thermolabile (destroyed by heating to 80–85° at pH 8·0) activator for the enzymic oxidation of dl-alanine.

B. M.

204. EULER, H. VON, ADLER, E., GUNTHER, G. and DAS, N. B.—Compounds of dehydrogenase systems. XXI. Enzymic degradation and synthesis of glutamic acid. II. In animal tissues. *Z. physiol. Chem.*, CCLIV, pp. 61–103, (1938). *Cf.* 1937, III, p. 392.

Glutamic acid is reversibly converted into iminoglutaric acid by a special apodehydrogenase of liver supplemented with cozymase or codehydrogenase II, the imino-acid subsequently spontaneously hydrolysing to ketoglutaric acid and NH_3. The rate of the conversion increases as the pH increases (6·35–8·4). In the reverse reaction (max. rate at pH 7·45, min. at pH 5·85), dehydrogenase systems which yield dihydrocozymase, dihydrocodehydrogenase II, and dihydrocozymase itself act as H donators. The apodehydrogenase content of kidney is approx. 40%, and that of other organs is much less than 40%, of that of liver. For the reaction (+) glutamic acid+ cozymase iminoglutaric acid+ dihydrocozymase, K=0–55 10^4 at pH 7·26. The chief physiological function of the apodehydrogenase is to make possible the interaction of NH_3 and ketoglutaric acid. The synthesis and transformation of amino-acids in the animal organism are discussed.

R. G.

205. GANAPATHY, C. V.—Application of the photo-electric colorimeter for the study of the kinetics of some Dehydrogenase reactions. *Current Science*, VI, No. 7, pp. 331-332, (1938).

The author has suggested the use of the photo-electric colorimeter for the study of the kinetics of dehydrogenase systems by measuring the variation in the concentration of methylene blue. The advantage of the method lies in its enabling an accurate estimation of the concentration of the dye at any stage of the reaction, thus permitting the kinetics of the action to be closely followed.

R. C. G.

206. GANAPATHY, C. V.—Redox systems in the latex of *Carica papaya*. *Current Science*, VI, No. 9, pp. 451-452, (1938).

The author has shown the presence of SH–SS redox system in the fresh latex of *Carica papaya* by continuous aeration at pH 7·4 with and without preliminary heating. It is found that the SH concentration in the first case falls continuously, while in the second case it remains constant for a period and then falls. The addition of ascorbic acid is found to have no effect on the cause of the oxidation of SH compounds. It is concluded therefore that the ascorbic acid is protected from oxidation by the sulphydryl compounds which coexist with the vitamin.

R. C. G.

207. GANAPATHY, C. V. and SASTRI, B. N.—Natural activators of Papain. *Proc. Ind. Acad. Sci.*, VIII, B, p. 399, (1938).

The authors have reported the results of their investigation of the natural activators of papain. They have shown that glutathione is a natural constituent of all plant juices which are rich sources of proteinases. Thus, the pressed juice of pineapple, *Ficus bengalensis*, cucumber and '*Calatropis gigantea*' contain glutathione. The natural activator of papainase is, therefore, found to be identical with that of liver cathepsin or yeast proteinase.

R. C. G.

208. GANAPATHY, C. V. and SASTRI, B. N.—The Natural Activators of Papain. *Current Science*, VI, No. 7, pp. 330-331, (1938).

The latex of '*Carica papaya*' has been found to contain glutathione which serves as a natural activator of papain. Papaya latex is fairly rich in SH compounds (about 2 per cent), about one-tenth of which is glutathione. While working on the natural activators of plant proteases, the authors have also recorded that the fresh juice of pineapple and of cucumber contain glutathione.

R. C. G.

209. GANAPATHY, C. V. and SASTRI, B. N.—Active Group of Papain. *Nature*, CXLII, p. 539, (1938).

Ganapathy and Sastri state that if the sulphydril group (SH) of the enzyme papain is oxidised by hydrogen peroxide, the enzyme loses its power to act upon peptone, but retains its hydrolysing power on gelatine, indicating that for gelatinase activity the SH group is not necessary. Also according to them, the papain hydrolysis of the protein takes place in two definite stages, first to peptone and then to simpler amino-acids, the activation mechanism being specific for the two stages.

B. M.

210. **Giri, K. V.**—Activation of tissue-phosphatases by magnesium. *Z. Physiol. Chem.*, CCLIV, pp. 117–125, (1938).

The activation of phosphatase from liver, kidney, or brain (sheep) by Mg increases if the purity of the enzyme is increased by ultrafiltration but decreases if the period of extraction is prolonged or if the enzyme is kept. Ultrafiltration does not increase the capability for activation of phosphatase from intestinal mucous membrane. B. M.

211. **Giri, K. V.**—Plant phosphatases. II. Relationships between Vitamin C and plant phosphatases. *Z. Physiol. Chem.*, CCLIV, pp. 126–138, (1938).

The degree of hydrolysis of Na-glycerophosphate and $Na_4P_2O_7$ by purified phosphatase from germinating soya bean is not affected by vitamin C but is diminished if substances (methylene-blue, $K_3Fe(CN)_6$, $Cu^{\cdot\cdot}$, but not ascorbic acid oxidase) which oxidise —C are also present, the extent of diminution increasing as the oxidising power of the substances increases. KCN, H_2S, $NaHSO_3$, glutathione, cysteine, and cystine wholly or partly counteract the effect of $Cu^{\cdot\cdot}$. P_2O_7'''' has a protective effect on —C and hence the —C—Cu complex restricts hydrolysis of $Na_4P_2O_7$ by the phosphatase less than that of Na-glycerophosphate. Dehydroascorbic acid alone or in presence of $Cu^{\cdot\cdot}$ has no effect on the activity of the phosphatase. B. M.

212. **Giri, K. V.**—Further studies on the hydrolysis of starch by sweet potato. *Journ. Ind. Chem. Soc.*, XV, pp. 249–262, (1938).

The author has investigated the constitution of the sweet potato starch and the nature of the amylase present in it. The enzyme behaves like a pure β-amylase. The saccharification limit for the hydrolysis of starch by sweet potato amylase corresponds to the value obtained with β-amylase of barley, and the nature of hydrolysis of amyloamylase is characteristic of pure β-amylase. The enzyme selectively hydrolyses a portion of the starch substance, leaving erythrogranulose as a residual material. Amyloamylase is hydrolysed by sweet potato, amylasaccharification taking place. It is suggested that sweet potato starch is hydrolysed by sweet potato amylase and barley β-amylase and the colour with iodine remains unchanged until complete saccharification takes place. It is suggested that β-starch possesses groups which produce colour with iodine. R. C. G.

213. **Mahal, H. S.**—Studies on Blood Choline Esterase. *Ind. Journ. Med. Res.*, XXV (3), pp. 703–712, (1938).

Experiments were made to determine the choline esterase activity of the blood of different species of animals by following titration, gasometric, and pharmacological methods. Frog's *rectus abdominis* was used for the latter. The activity varied in different species and also in individuals of the same species but was constant for the same individual over prolonged periods. There was no difference in the esterase activity of arterial and venous blood. The activity was retained for more than 48 hours if the blood was stored in the refrigerator, but lessened by heating above 40°C or dilution with H_2O. Sleeplessness, changes in surrounding temperature, starvation, and feeding with glucose did not affect the esterase activity. Injections of drugs such as strychnine, morphine, acetylcholine and cobra venom also had no effect on the blood choline esterase activity. H. S. M.

214. **Ranganathan, V.** and **Sastri, B. N.**—Determination of nature of degradation products during proteolysis. *Proc. Ind. Acad. Sci.*, VIII, B, pp. 243–248, (1938).

A known amount of protein dispersed in a buffer is incubated with the enzyme and at definite intervals of time two equal portions of 20 c.c. are withdrawn. In one, total- and amino-N is determined, and in the other after removal of protein by pptn. with 10% trichloroacetic acid. By the use of formula (derivation given) the 'complexity factor' is obtained which is a measure of the complexity of the degradation products. Application of this formula to the results of Northrop (A. 1933, 94) and Bhagvat (A. 1937, III, 368) shows that the hydrolysis of casein by crystal trypsin ceases when peptides containing approximately ten amino-acids are liberated, whilst with crude trypsin proteolysis goes practically to completion. B. M.

215. SINGH, B. N. and MATHUR, P. B.—Cellulose in potato sprouts. *Current Science*, VII, pp. 281-282, (1938).

The sprouts of actively germinating tubers when incubated at 30°C with cardboard suspended in dil. $(NH_4)_2.CO_3$ destroy cellulose, particularly xylan. B. N. S.

VITAMINS.

216. BANERJEE, B. N. and RAMSHARMA, G. B.—Vitamin A and C content of mangoes. *Agriculture and Live-stock in India*, VIII, pp. 253–258, (1938).

Data for numerous varieties of mangoes are given. Values differ widely among different varieties and to a considerable extent between different samples of the same variety. B. M.

217. BANERJEE, S.—Vitamin C and disease. *Science and Culture*, III, No. 12, p. 656, (1938).

The paper deals with the relationship of vitamin C to various diseases and pathological conditions, namely latent scurvy, infection, heart failure, haemorrhagic states, anaemia, healing of fractures, dental decay, cataract, glycosuria, morbid pigmentation, peptic ulcer and tuberculosis. The above review indicates that vitamin C has not only antiscorbutic properties but it is associated with numerous physiological and pathological conditions. R. C. G.

218. BASU, N. K.—Leprosy and vitamin B_2 deficiency. *Z. Vitaminforsch.*, VII, pp. 297-298, (1938).

A lack of vitamin B_2 is an important factor in the development of experimental leprosy in mice. B. M.

219. BISWAS, H. G.—Vitamin B_1 and B_2 content of Molasses. *Science and Culture*, III, No. 2, p. 627, (1938).

The vitamins B_1 and B_2 content of the molasses obtained from different sources have been assayed according to the biological method with young rats. The molasses from date-palm has been found to contain 21·6–24·3 units of vitamin B_1 and 16·0–17·3 units of vitamin B_2 per 100 gm., whereas sugarcane molasses contain 10·4 and 2·7 units of vitamin B_1 and vitamin B_2 respectively. Solidified date-palm molasses ('*Khejur Patali*') contain 8·75 and 6·45 units vitamin B_1 and B_2 per 100 gm. respectively. R. C. G.

220. BISWAS, H. G. and DAS, K. L.—Vitamin C in the Juice of the ripe Palmyra fruit. *Science and Culture*, III, No. 9, p. 498, (1938).

The sugar content as well as the ascorbic acid content of the ripe palmyra fruit ('*Bengali Tal*') have been determined. The ascorbic acid content varies from 0·708 to 1·579 mg. per 1 gm. and the percentage of total sugar present varies from 4·21 to 5·18. The follicle of the germinated Palm stone contains 0·130 to 6·175 gm. of ascorbic acid per gm. while the total sugar content is 18·5 to 19·50 per cent. R. C. G.

221. **Dann, W. J.** and **Subbarow, Y.**—Differentiation of rat dermatitis factor and chick dermatitis factor from nicotinic acid. *J. Nutrition*, XVI, pp. 183–195, (1938). ..

Experimental data indicate that vitamin B_6 and the filtrate factor are both distinct from nicotinic acid. B. M.

222. **De, N. K.** and **Majumdar, B. N.**—Further Studies on Factors affecting the Vitamin A Activity of Animal and Vegetable Products. *Ind. Journ. Med. Res.*, XXV (4), pp. 857–862, (1938).

Further experiments were carried out on the study of heat, cooking, aeration, hydrogenation, etc., on the vitamin A and carotene content of foodstuffs of both animal and vegetable origin. In general the vitamin A and carotene content of natural foodstuffs were little affected by boiling in water in open vessels. The use of sodium bicarbonate and tamarind in cooking had no destructive influence on vitamin A and carotene. Appreciable losses (10 to 20γ) of vitamin A occurred during the melting of butter and ghee, the amount of loss depending on the degree of heat applied. Both aeration and hydrogenation, and heating in a waterbath in an open vessel, were found to be destructive of the vitamin A content of butter, ghee, cod liver oil and red palm oil. Ghee used in frying potato chips lost a considerable portion of its vitamin A content during every operation of frying. Prolonged heating caused a marked loss of vitamin A from milk. Sour whole milk (curd) was found to be poorer in vitamin A than the original milk from which it was prepared; the loss was more prominent when the curd was prepared by fermenting milk at 37°C than at room temperature (16–22°C). N. K. D. & B. N. M.

223. **De, N. K.**, **Majumdar, B. N.** and **Sundararajan, A. R.**—The Vitamin A Activity of Some Fish Oils and Vegetable Foods. Parts I and II. *Ind. Journ. Med. Res.*, XXVI (2), pp. 435–440, (1938).

Thirty fish oils and 45 vegetable foodstuffs were assayed for vitamin A and carotene respectively. The oils were prepared from some species of fishes caught around the Madras coast. Liver oils of some of these fishes were found to be many times richer in vitamin A than Norwegian cod liver oil. Of the vegetable foodstuffs assayed, the green vegetables and some of the ripe fruits were rich in carotene. N. K. D.

224. **De, N. K.** and **Majumdar, B. N.**—The Assimilation of Carotene by Rats from a 'Poor Madrassi Diet': The Influence of Skimmed Milk and Calcium Lactate. *Ind. Journ. Med. Res.*, XXVI (2), pp. 441–446, (1938).

In continuation of the carotene metabolism work reported previously, further experiments were undertaken to study the rate of assimilation of carotene by rats fed on a 'poor Madrassi diet', unsupplemented and supplemented with skimmed milk and calcium lactate respectively. The difference between the amount of carotene consumed in the food and that excreted in the faeces was taken as a measure of the amount of carotene absorbed. About 60 per cent of the carotene was absorbed by rats fed on the mixed diet. Neither of the supplements, although producing an acceleration of growth, showed any significant influence on the carotene metabolism. N. K. D. & B. N. M.

225. **Ghosh, B. N.** and **Guha, B. C.**—Vitamin C and toxins. Part 1. The effect of vitamin C and other reducing substances on Diphtheria and Tetanus toxins *in vitro*. *Journ. Ind. Chem. Soc.*, XV, pp. 438–442, (1938).

The effect of vitamin C, glutathione, cysteine and hydroquinone on diphtheria and tetanus toxins *in vitro* has been investigated. It was found that 2 mg. of the vitamin mixed with 1 M.L.D. of the toxin was able to cause inactivation. The effect of pH on the toxin was studied and it was found that the lowering of pH resulted in quick inactivation. Diphtheria toxin at pH 5·4 was active but it was detoxicated at the same pH in the presence of ascorbic acid. This indicated that the effect of ascorbic acid was at least partially due to the effect of ascorbic acid 'per se' and not merely due to a pH effect. At pH 6·8 ascorbic acid had no inactivating effect on the toxin studied.

R. C. G.

226. Ghosh, B. N. and Guha, B. C.—Vitamin C and toxins. Part 2. The effect of the administration of vitamin C to guinea-pigs injected with diphtheria and tetanus toxins. *Journ. Ind. Chem. Soc.*, XV, pp. 443–448, (1938).

Injections of ascorbic acid immediately before and after injections of 1 M.L.D. of the diphtheria and tetanus toxins appeared to have some protective action on guinea-pigs. Ascorbic acid injected long before or long after the administration of the toxins failed to save the animals. Previous injection with the toxin-vitamin mixture also failed to confer any protection against diphtheria toxin injected subcutaneously.

R. C. G.

227. Ghosh, B. N.—Observation on the relation between pregnancy, sex-hormones and the vitamin C content of the tissues of guinea-pigs. *Journ. Ind. Chem. Soc.*, XV, pp. 449–454, (1938).

The effects of pregnancy and of the injection of a lutoinising hormone on the onset of scurvy in guinea-pigs were investigated and, contrary to the observations of Bourne, no delaying effect in the onset of the disease was observed. Injections of luteinising and follicular hormones into virgin guinea-pigs did not appreciably alter the vitamin C content of the different tissues of the animals. Results of statistical analyses of the data obtained are given.

R. C. G.

228. Giri, K. V.—Test for Vitamin C. *Mikrochem.*, XXIII, pp. 283-284, (1938).

0·5 c.c. of 10% trichloroacetic acid and 1 c.c. of the test solution are added to 0·5 c.c. of 0·6% $K_3Fe(CN)_6$. After mixing, 1 c.c. of 2·5% ammon. molybdate (in $5N\text{-}H_2SO_4$) is added. In presence of vitamin C a reddish-brown colour or a red ppt. is formed after 2-3 min. The test is sensitive to 0·02 mg. of C in 1 c.c. of solution, and can be applied as a drop test.

B. M.

229. Giri, K. V.—Vitamin C and Phosphatases. *Nature*, CXLI, p. 119, (1938).

The author reports that in a system containing vitamin C, glycerophosphate and phosphatases, when the vitamin C is oxidised by metallic catalysts like copper ions and other oxidising agents, the activity of the phosphatase is inhibited. Glutathione and other reducing agents can remove this inhibition.

R. G.

230. Giri, K. V.—New colorimetric method for determining Vitamin C. *Proc. Soc. Biol. Chem. India*, III, pp. 35–37, (1938).

The colour developed by ascorbic acid in presence of $K_3Fe(CH)_6$ and $(NH_4)_2MnO_4$ may be conveniently measured by the step-photometer using a S50 filter. Addition of gelatin prevents the separation of a ppt. in the solution.

B. M.

231. Giri, K. V. and Doctor, N. S.—Pyrophosphate in the Determination of Vitamin C Content of Plant and Animal Tissues. *Ind. Journ. Med. Res.*, XXVI (1), pp. 165–170, (1938).

The use of pyrophosphate in the determination of vitamin C content of plant materials and animal tissues, and in the preparation of stable aqueous solutions of the vitamin are described. Addition of pyrophosphate to trichloracetic acid, which is generally used for extraction of vitamin C, is recommended, since the pyrophosphate is found to inhibit the oxidation of the vitamin during extraction. Among the plant materials analysed, Indian gooseberries are found to be the richest source of vitamin C, the edible fleshy portion containing as much as 7·3 mg. of vitamin C per g. of fresh material. The powder obtained by drying the pulp of Indian gooseberries, at room temperature, contains about 25 mg. of vitamin C in 1 g. of the powder. The whole normal requirement of vitamin C can readily be met by eating one or two berries a day. K. V. G. & N. S. D.

232. Greval, K. S. and Kochhar, B. D.—Vitamin A contents of Ghee. *Ind. Journ. Med. Res.*, XXV (3), p. 623, (1938).

The Carr-Price blue values of a number of samples of butter and ghee have been determined. The samples of the butter fat prepared at the laboratory gave the Carr-Price blue value of 0·85 ± 0·081. The market butters in summer had the Carr-Price value of 0·36 ± 0·19 and in winter 0·58 ± 0·12. The Carr-Price blue value of samples of ghee collected from village was 0·23 ± 0·16 and that of samples collected in the city was 0·31 ± 0·17. The chemical constants of all the fats were determined, and it was found that the butter fat sold in the Lahore market was grossly adulterated. R. C. G.

233. Guha, B. C. and Sen-Gupta, P. N.—Ascorbigen in plant and animal tissues. *Nature*, CXLI, p. 974, (1938).

Combined ascorbic acid (ascorbigen) was found in cabbage and in the brain and liver of a normally fed guinea-pig. In cabbage, free ascorbic acid is released by heating or by treatment with H_2S. Tests on guinea-pig showed that ascorbigen is as powerful an anti-scorbutic agent as ascorbic acid. B. M.

234. Mukherjee, A.—Vitamin B complex in toxic conditions. *Journ. Ind. Chem. Soc.*, XV, pp. 617–622, (1938).

The effects of aneurin, lactoflavin and frankonite-filtrate of aqueous yeast extract have been tried in toxic conditions caused by 15% cod liver oil in foods of a colony of white rats weighing 50–60 gm. each. All these substances caused detoxication but lactoflavin seemed to be most effective. Vitamin B complex appeared to act better than any of the factors alone. Nicotinic acid had all along been found to be ineffective and, possibly, it is a little toxic as well. R. C. G.

235. Nair, K. Ramakrishnan—Vitamin C subnutrition in Indians. *Current Science*, VI, No. 7, p. 324, (938).

To know the state of vitamin C nutrition, fifteen 'normal' individuals living on South Indian middle class dietary were examined using the method of Harris and Ray and that of Birch, Harris and Ray for the estimation of vitamin C. Only in three out of the fifteen cases studied were the normal response obtained. These preliminary experiments indicated that partial deficiency of vitamin C is the rule and optimal intake is the exception in South India. R. C. G.

236. Narasimharao, M.—Vitamin C and Peptic Ulcer. *Ind. Journ Med. Res.*, XXVI (1), pp. 171–176, (1938).

The ascorbic acid content of the blood in 15 cases of peptic ulcer gave normal values between 0·4054 to 1·920 with an average of 0·8971. And nine patients with peptic ulcer as well as five healthy controls showed marked vitamin C subnutrition as judged by Harris and Ray's test dose technique. Vitamin C subnutrition is thus found to be not in any way peculiar to the peptic ulcer patient and cannot be directly attributable as a cause of the frequent occurrence of peptic ulcer in South India. M. N.

237. **Patwardhan, V. N.** and **Chitre, R. G.**—Effect of hypervitaminosis-D on the calcium and phosphorus metabolism in albino rats. *Proc. Soc. Biol. Chem. India*, III, p. 63, (1938).

When Vigantol was administered to albino rats in doses of 4,500 international units daily, urinary excretion of calcium, phosphorus and nitrogen increased, faecal calcium first rose and then fell, faecal phosphorus fluctuated irregularly, urinary excretion of phosphorus was in excess of calcium and there was a greater removal of phosphorus than of calcium from the body. Administration by the intravenous was more toxic than by the oral route.

V. N. P. & R. G. C.

238. **Radhakrishna Rao, M. V.**—Studies on Vitamin A deficiency. Part III. Lesions of the Peripheral Nervous System. *Ind. Journ. Med. Res.*, XXV (3), pp. 661–670, 2 figs., (1938).

The peripheral nerves of rabbits, rats, and fowls fed on diets deficient in vitamin A and carotene were examined histologically for evidence of myelin sheath degeneration. Despite the absence of any clinical signs of nervous lesions in the majority of the animals, some myelin degeneration was usually present. It is concluded that vitamin A is not the only nutritional factor concerned in the maintenance of healthy nerve and that both in man and experimental animals a variety of dietetic deficiencies may give rise to nervous degenerations.

M. V. R. R.

239. **Rao, M. V. R.**—Treatment of Phrynoderma by vitamin A concentrate. *Ind. Med. Gaz.*, LXXIII, pp. 461-462, (1938).

The effect of vitamin A concentrate on the papular eruption in phrynoderma was studied in two advanced cases. In both instances, the follicular lesions had disappeared after the administration of about 10·0 c.cm. of the concentrate. The results of the therapeutic tests confirm the previous observation that phrynoderma is probably a manifestation of a nutritional deficiency in which lack of vitamin A is an important factor.

R. C. G.

240. **Rao, M. N.**—Vitamin B and peptic ulcer. *Ind. Med. Gaz.*, LXXIII, pp. 457–461, (1938).

The author found an increase in the bisulphite-binding substances in the blood of peptic ulcer patients in a good percentage of cases, indicating a definite deficiency of vitamin B in these patients.

R. C. G.

241. **Rothenheim, C. A.**, **Shaik Mahamud, H. S. S.** and **Cowlagi, S. S.**—Vitamin C contents of Indian foodstuffs—Chillies (Capsicum). *Journ. Ind. Chem. Soc.*, XV, No. 1, p. 15, (1938).

The ascorbic acid content of several varieties of Indian chillies (capsicum) available in Bombay market was determined following the modified method of Tillmans using 2·6-dichlorophenolindophenol. Appreciable differences varying from 0·046 to 0·168 mg. per gm. or from 0·230 to 0·661 mg. per gm. were found in different samples of the same variety. The formation of ascorbic acid was found to be greater in ripe chillies than in the green ones. The presence of iron in chillies could not be detected. From observations based on the estimations of reduced and reversibly oxidised ascorbic acid, it is suggested that ascorbic acid always existed in plant material as a reversibly oxidised derivative along with the free acid.

R. C. G.

242. **Rudra, M. N.**—Studies in vitamin C. Part V. The vitamin C content of some germinated cereals and pulses. *Journ. Ind. Chem. Soc.*, XV, pp. 191–193, (1938).

The vitamin C content of some germinated cereals and pulses has been determined by modified Tillmans method after reducing the trichloroacetic acetic acid extract with hydrogen sulphide (H_2S). 'Mung' (*Phaseolus mungo*) has been found to synthesise the greatest amount (as much as 231 mg. per 100 g.) of vitamin C. The author has suggested that the dicotyledons can synthesise relatively higher amounts of vitamin C than the monocotyledons.

R. C. G.

243. **Ray**, S. N.—Effect of hyperthyroidism on the metabolism of vitamin C. *Journ. Ind. Chem. Soc.*, XV, pp. 237–239, (1938).

Administration of desiccated thyroid gland (0·1 g.) to rabbits increases the amount of vitamin C needed for complete protection, probably by increasing the rate of its metabolism. A dose of 0·1–0·5 g. decreases the vitamin C content of the kidneys, but not the liver or adrenals of rats.

B. M.

244. **Sengupta**, P. N. and **Guha**, B. C.—The Estimation of Vitamin C in foodstuffs. *Science and Culture*, III, No. 7, p. 398, (1938).

Certain modifications of the Tillmans-Harris technique for the estimation of vitamin C in foodstuffs are outlined. The method consists in (1) heating the material in a suspension of water with hydrogen sulphide on a boiling water bath for 15 minutes in order to split up ascorbigen and reduce the dehydro-ascorbic acid present, (2) removing the hydrogen sulphide by nitrogen or carbon dioxide, (3) extracting with trichloroacetic acid, and (4) titrating one portion with the indophenol indicator and then the remaining portion after incubation with ascorbic acid oxidase. The difference in the titration values gives the content of ascorbic acid.

R. C. G.

245. **Subbarow**, Y., **Dann**, W. J. and **Meilman**, E.—Effect of 3-aminopyridine in experimental black-tongue. *J. Amer. Chem. Soc.*, LX, pp. 1510-1511, (1938).

One ton of fresh liver yields 150 mg. of 3-aminopyridine, which appears to cure acute experimental black-tongue in dogs as well as nicotinic acid does.

R. C. G.

246. **Subbarow**, Y. and **Dann**, W. J.—Inactivity of 3-aminopyridine in black-tongue. *J. Amer. Chem. Soc.*, LX, p. 2565, (1938).

Further experiments by the authors indicate that 3-aminopyridine is not a black-tongue preventive factor.

R. C. G.

247. **Wilson**, H. **Ellis** C. and **Roy**, G. K.—The Flavine and Vitamin B_6 Content of Indian Foodstuffs. *Ind. Journ. Med. Res.*, XXV (4), pp. 901–910, (1938).

The estimation of the flavine content of 90 Indian foodstuffs has been carried out both by biological assay and chemical methods. The estimation of vitamin B_6 in 25 Indian foods has been carried out by biological assay.

The pulses followed by the leafy vegetables are good sources while the fruits are poor in flavine. Much the same relative distribution has been noted for B_6, fish tissue however being a moderately good source.

H. E. C. W.

BASAL METABOLISM.

248. **Ahmad**, B., **Lal**, R. B. and **Roy**, N. C.—Observations on the Basal Metabolism of Healthy subjects under varying conditions of Temperature and Humidity. *Ind. Journ. Med. Res.*, XXVI (1), pp. 205–212, (1938).

This paper is based on studies in basal metabolism of young healthy Indians under two different sets of atmospheric conditions with regard to temperature and humidity existing side by side, so that the effects of sudden changes could be observed on the same subjects.

The two sets of atmospheric conditions were:—

(1) The ordinary warm and humid conditions prevailing during the monsoon season in Calcutta when the temperature varied between 85°F and 90°F and relative humidity between 67 and 80 per cent.

(2) The air-conditioned rooms in the All-India Institute of Hygiene and Public Health where the temperature varied between 75 to 80°F and relative humidity between 51 and 59 per cent.

Nine subjects were employed in these experiments. Unmistakable evidence of decrease in the rate of heat production in all the nine subjects was found on their going to the air-conditioned rooms from outside. The decrease ranged from 5 to 9·6 per cent. According to the authors, the results would appear to suggest that in estimating the efficiency of ventilation it is not enough to consider the rate of loss of heat by the body, but it is necessary to take into account the rate of production of heat as it is definitely influenced by the atmospheric changes in temperature and humidity. These remarks should apply only to circumstances when the subjects are exposed to sudden changes in atmospheric conditions. It is probable that when changes are slow and take place by degrees, for instance in seasons changing, the body adjusts itself to the altered conditions, so that no appreciable changes in basal metabolism of individuals occur on that ground.

B. A.

249. RAJAGOPAL, K.—The Basal Metabolism of Indian and European Men on the Nilgiri Hills (S. India). *Ind. Journ. Med. Res.*, XXVI (2), pp. 411–426, (1938).

The basal metabolism of 26 Indian and 20 European men was studied on the Nilgiri Hills in South India (6,000 feet above mean sea level) under identical climatic conditions. A Benedict-Roth apparatus was used in the investigation. The average basal metabolism for Indians was found to be 12·5 per cent Aub-Du Bois standard. The corresponding figure for the Europeans was 4·3 per cent. It is probable that racial factors are responsible for the lower values in Indians, on an average 8·2 per cent below the European controls.

K. R.

250. RAY, S. N. and GANGULY, R.—Urinary composition of normal Bengalee subjects. *Ind. Journ. Med. Res.*, XXVI (2), pp. 459–464, 1 table, (1938).

The average composition of 24-hours-samples of urine is given. The subjects, numbering about 50, were all middle class Bengalee Hindus in normal health. The average figures in grams for various excretas are: urea 4·3, creatinine 1·38, uric acid 0·70, total nitrogen 4·83, inorganic sulphate (as SO_3) 0·65, ethereal sulphate (as SO_3) 0·10, neutral sulphate (as SO_3) 0·18, chlorides (as NaCl) 17·4, inorganic phosphorus 0·68, and calcium 0·061. The significance of these findings is discussed.

S. N. R.

251. RAY, S. N. and GANGULY, R.—Observations on the metabolic activities of patients suffering from epidemic dropsy. Part I. Urinary compositions of epidemic dropsy patients. *Ind. Journ. Med. Res.*, XXVI (2), pp. 465–468, 1 table, (1938).

Patients suffering from epidemic dropsy excrete in 24 hours 0·94 grms. uric acid. This figure is about 50% higher than the amount of uric acid excreted by normal Bengalees on the same diet. On the other hand, the respective figures for the excretion of inorganic phosphorus, chlorides and calcium by epidemic dropsy patients are 0·11, 11·4 and 0·019 grms. per 24 hours. These figures are much lower than the corresponding figures for normal subjects. The utility of these findings in clinical examinations is stressed.

S. N. R.

252. WILSON, H. ELLIS C. and ROY, N. C.—Observations on the Basal Metabolism of Indian Boys in Calcutta. *Ind. Journ. Med. Res.*, XXV (4), pp. 901–910, (1938).

The basal metabolic rate of 62 (mostly Hindus) boys of ages 6 to 16 from a poor class in Calcutta has been studied. The results are lower in varying degrees when compared to the standard figures of Aub and Du Bois, Boothby and Sandiford and Nakagawa, while somewhat higher than those of Benedict (modified).

Taking all standards into consideration the figures might justify the conclusion that the metabolic rate tends to be on the low side. Considering the fact that the boys are of a poor class, underweight and on a low protein diet, it would appear unjustifiable to favour the hypothesis of a racial factor being the cause.

H. E. C. W.

BIOCHEMISTRY AND PHYSICAL CHEMISTRY.

253. BISWAS, M. M.—Adsorption of hydrogen ions by serum globulin and its antibody. *Ind. Journ. Med. Res.*, XXVI (2), pp. 469–480, 6 figs., (1938).

Titration curves have been drawn with pure pseudoglobulin of normal horse serum and its antibody globulin obtained from a rabbit, using N/10 solutions of hydrochloric and oxalic acids, baryta and caustic soda. Corresponding titration curves have been drawn with the pseudoglobulin of normal rabbit's serum for reference. Results of titration show that the adsorption of H ions by normal pseudoglobulin of both horse and rabbit is practically similar. Also both the normal and antibody globulins adsorb H ions from the acids in a similar way. Above pH = 5·0, titration with baryta shows a normal behaviour; whereas titration with N/10 caustic soda suggests that normal globulin possesses stronger affinity for H ions than the antibody globulin at a higher level of pH than the iso-electric point. This suggests that normal globulin probably undergoes some change during immunisation, when certain characteristic end groupings are developed in the protein molecule.

M. M. B.

254. BOSE, J. P.—Protamine Zinc Insulin. *Ind. Med. Gaz.*, LXXIII, pp. 390–395, (1938).

Protamine zinc insulin by its slower action for prolonged periods can control hyperglycaemia, glycosuria and ketosis during the night without the patient having to take one or two nocturnal injections; high carbohydrate diet can be spread out more evenly over all meals and there is less likelihood of sudden reduction of blood sugar. Its disadvantages are the insidious onset of hypoglycaemia, cumulative effect, no uniformity of action and longer time to act. In severe diabetes, when there is much ketosis, either large and repeated doses of ordinary insulin or a combination of ordinary insulin with protamine zinc insulin should be given until the condition has improved sufficiently when the protamine zinc insulin may alone be continued. Well-controlled diabetics in good health with ordinary insulin and who do not mind two injections a day should be left alone.

N. D.

255. CHAKRAVARTI, D. N. and TYAGI, N.—Studies in 'effects of heat'. Part I. Biochemical and Physical changes in ten cases suffering from 'effects of heat'. *Ind. Journ. Med. Res.*, XXV (3), pp. 791–827, 7 figs., (1938).

Blood and urine samples were analysed, mainly by colorimetric methods. Retention of N.P.N. constituents in blood was found, severe cases showing other signs of renal insufficiency as well. In both blood and urine a low concentration of chlorides were observed. The authors have tried to show that hypochloraemia in 'effects of heat' cases could not be entirely due to sweating and other natural means of chloride loss and have made a tentative suggestion that the high concentration of other anions in the blood necessitates a shift of chlorides to maintain an acid-base equilibrium. Physical data of some of the blood samples have been given. The studies being preliminary to further work in progress, no definite conclusions were drawn. A high viscosity and specific gravity with low surface tension and electrical conductivity appear to be generally present in severe cases.

D. N. C.

256. **Chopra, R. N.** and **Roy, A. C.**—The Effect of Seitz filtration of haemolysins and the components of a haemolytic system. *Ind. Journ. Med. Res.*, XXVI (1), pp. 303–310, (1938).

The effect of Seitz filtration upon some of the well-known haemolytic agents—saponins, bacterial haemolysins, etc. were studied. Dilute solutions of saponin (Merck's) cyclanine and saponin isolated from *Barringtonia acutangula* lose their haemolytic property when passed through a Seitz filter. It should be noted in this connection that the Seitz filter can effectively remove the haemolysin only in dilute solutions and this dilution in turn depends upon the nature of the substance. Concentrated solutions of active substances are comparatively unaffected. Bacterial haemolysins are similarly affected. But the use of the Seitz filter in investigations relating to bacterial toxins and when dealing with dilute solutions is attended with serious difficulties.

R. N. C.

257. **De, Premankur** and **Chatterjee, Chandi Charan**—The rôle of Formalin in the estimation of nitrogen in body fluids. *Ind. Journ. Med. Res.*, XXV (4), pp. 917–922, 4 tables, (1938).

In estimation of urea, N.P.N., albumen, etc. the nitrogen is converted into ammonium salts. This is then usually determined either by nesslerisation or by back-titration, but can also be done with formalin. Formalin is neutralised and added to the solution of ammonium salts also neutralised. Acid, equivalent to ammonia, is liberated. From this the nitrogen and hence the original substance is calculated. From various control experiments it has been found that this method can be used as a substitute for nesslerisation and also for checking the doubtful results of back-titration.

P. D. & C. C. C.

258. **De, Premankur** and **Bhattacharyya, Sukumar**—A comparative study of glycolysis in normal and diabetic blood. *Ind. Journ. Med. Res.*, XXV (4), pp. 923–932, 4 charts, 2 tables, (1938).

A comparative study of glycolysis in oxalated blood in normal and diabetic cases shows that the average rate of glycolysis in normal blood, 3·83–6·50 mgm. per hour per 100 ccs., is lower than that in diabetic blood, 4·0–16·6 mgm. per hour per 100 ccs.; while the velocity of percentile glycolysis in normal blood, 6·05 mgm. per hour per 100 ccs., is higher by about 23·8 per cent than that in diabetic blood, 4·61 mgm. per hour per 100 ccs.

P. D. & S. B.

259. **De, Premankur** and **Bhattacharyya, Sukumar**—Glycolysis in drawn blood in 24 hours. *Ind. Journ. Med. Res.*, XXV (4), pp. 933–936, 1 chart, 2 tables, (1938).

Complete glycolysis does not take place even in 24 hours. The amount glycolysed is found to bear a more or less inverse ratio to the initial sugar concentration. Accumulation of lactic acid has been suggested as the probable cause of diminution of glycolysis in later periods. The amount of non-glucose copper-reducing substances in blood is found to be about 6–8 mgm. per 100 ccs. of blood.

P. D. & S. B.

260. **Dikshit, B. B.**—Formation of acetylcholine by the tissues. *Proc. Soc. Biol. Chem. India*, III, p. 63, (1938).

In presence of eserine, acetylcholine is formed by thin slices of dog or rabbit brain respiring in a special saline medium. The hypothalamus forms more acetylcholine than the cortex, while the pancreas produces it both aerobically and anaerobically at the rate of 0·2/μg. per g. of fresh tissue per hour.

B. M.

261. **Dikshit, B. B.**—Acetylcholine formation by tissues. *Quart. J. Exp. Physiol.*, XXVIII, pp. 243–251, (1938).

All isolated tissues of the dog containing nerve cells form acetylcholine when suspended in warm eserinised Locke's solution and oxygenated for 5 hours. Plain muscle does not produce acetylcholine. The production of acetylcholine by the gastro-intestinal tract and the bladder is due to nerve plexuses. The production of acetylcholine by the auricle is 10 times that by the ventricle and is explained by the proportion of nerve cells in these tissues.

B. M.

262. GHOSH, B. N. and DE, S. S.—Effect of pH, electrolytes, normal and immune sera on cataphoretic velocity of *Leishmania tropica*. *Journ. Ind. Chem. Soc.*, XV, pp. 233–236, (1938).

The charge on *L. tropica* in glucose or 0·2% NaCl solutions is positive for pH below 3·0, then reversing, and negative for pH above 3·4. Cataphoretic velocity in NaCl solution increases with decrease in concentration; rabbit sera decrease this velocity, the effect being greater with immune than with normal serum. The iso-electric point is pH 5·3.

B. M.

263. GHOSH, J. C.—The Physico-Chemical properties of Ascorbic Acid. *Journ. Ind. Chem. Soc.*, XV, No. 1, p. 1, (1938).

Some aspects of the physico-chemical properties of ascorbic acid such as auto-oxidation, reversible oxidation and reduction, anisotropic properties of the molecule, the chemical reaction involved in the formation of neutral salt from dehydro-ascorbic acid, etc., have been studied. Substances like glutathione, cysteine, etc., can inhibit the auto-oxidation of the synthetic ascorbic acid while copper acts as an accelerator of the spontaneous process of auto-oxidation of ascorbic acid. The inhibition is complete when the ratio of copper to sulphydril compounds is 1 : 1. Besides the specific protective action of sulphydril compounds present in minute traces, it has also been observed that the various amino-acids can inhibit the oxidation of ascorbic acid when present in equivalent proportions. The inhibitory effect of chlorophyl on the auto-oxidation of the acid indicates that whenever ascorbic acid is found in the plant and animal kingdom, Nature always associates it with materials which prevent its oxidative destruction.

R. C. G.

264. IYENGAR, N. V. R.—Determination of chloride in coloured biological fluids. *Proc. Soc. Biol. Chem. India*, III, pp. 18–20, (1938).

Before titration with $AgNO_3$, the solution is decolorised by treatment as described with H_2O_2 or $KMnO_4$.

B. M.

265. LINTON, R. W., MITRA, B. N. and SEAL, S. C.—Electrophoresis and metabolism of some vibrio strains in relation to variability and chemical classification. *Ind. Journ. Med. Res.*, XXVI (2), pp. 329–334, (1938).

A study of the chemical structure and metabolic activity of 33 vibrio strains including both rough and smooth organisms, received from different sources, indicates a close correlation between the two characteristics and shows that changes in chemical structure are accompanied by changes in metabolism. This confirms the authors' previous findings. Also, the serological changes whether brought about by treatment with antiserum (B. White) or by other processes follow changes in chemical structure, metabolism and surface potential. A shift in the latter is the cause of serological distinction of the R-derivatives from their S-homologues and partly accounts for the more generalised serological behaviour of the R-strains.

S. C. S.

266. MUKERJI, B. and GUHA, R. C.—The action of choline in the prevention of fatty livers produced by anterior pituitary extracts. *Ind. Journ. Med. Res.*, XXVI (1), pp. 295–302, 4 tables, (1938).

Best and his co-workers (1932–1936) made the interesting observation that the feeding of choline chloride prevents the marked increase in the concentration of liver fat which occurs in rats on fasting, on cholesterol feeding and by diets rich in fats. They further observed that the injection of anterior pituitary extracts causes a considerable deposition of fat in the livers. In this communication, an attempt has been made to see whether the feeding of choline prevents the increase of liver fat produced by the injection of anterior pituitary extracts.

Three groups of rabbits were kept on a standard diet and treated as follows:—(*a*) Normal controls without any injection; (*b*) injection of anterior pituitary extract; (*c*) choline feeding (500 mg/kg.) for 8 days and anterior pituitary injections. The rabbits were killed 20 hours after anterior pituitary injections and the content of liver fatty acids and their iodine numbers were determined. The average fatty acid content following injections of anterior pituitary extract was 6·50 per cent. The animals fed with choline chloride did not show any significant diminution in the concentration of liver fatty acids (5·82 per cent) and there was no noticeable difference in the iodine numbers. It seems probable that the mechanism by which fatty livers are produced by injections of anterior pituitary extracts may not be the same as that responsible for causing fat deposition after cholesterol and fat feeding. The theoretical implications of these possibilities have been discussed.

B. M.

267. Nandi, B. K. and Dikshit, B. B.—A new Colorimetric test for Plasmoquine. *Ind. Journ. Med. Res.*, XXV (4), pp. 937–950, (1938).

This new test is an application of Folin's phenol reagent to plasmoquine. When a few drops of the reagent are added to an aqueous acid solution of plasmoquine and the mixture made alkaline by sodium carbonate, a blue colour develops, which deepens into its maximum intensity in about half an hour and remains constant for about three hours. This test can detect plasmoquine up to a dilution of 1 in a million and can be used for quantitative estimations colorimetrically up to 1 in 200,000. Although the test is not specific for plasmoquine, it can be extended to detect and estimate plasmoquine in tissues by treating the latter with an excess of caustic soda and extracting with ether. Control experiments with normal tissues of various animals gave uniformly negative results. A number of experimental results on animals both *in vitro* and *in vivo* have been appended. The test could not, however, be extended for detection of plasmoquine in the urine. A theory of the mechanism of the colour development has been advanced.

B. K. N.

268. Pasricha, C. L., Goyal, R. K. and Lal, S.—The Hydrogen ion concentration of human faeces. *Ind. Med. Gaz.*, LXIII, pp. 141–143, (1938).

The authors have determined the pH of 562 samples of faeces by the colorimetric method. The reaction of the faeces from breast-fed babies was acid while from those fed on cows' milk, it was alkaline in reaction.

The reaction of the faeces of the adults was found to vary according to the type of diet. The reaction of the faeces on European diet was alkaline and the reaction of the faeces on Indian diet, *i.e.*, with high percentage of rice, was acid. Substitution of rice with bread changed the reaction of the faeces from acid to alkaline.

B. M.

269. Pasricha, C. L., Lal, S. and Malik, K. S.—The specific gravity of the serum of Epidemic Dropsy patients. *Ind. Med. Gaz.*, LXXIII, pp. 283-284, (1938).

The specific gravity of the serum of twelve epidemic dropsy patients was compared with that of healthy individuals. It was found that when the specific gravity of the serum was 1·0235 or lower, oedema was present and when it approached to normal, oedema disappeared.

M. A.

270. Pillai, R. K.—Dephosphorylation in muscle extracts. *Biochem. J.*, XXXII, pp. 1087–1099, (1938).

Of the three phosphatases in fresh muscle extract, inorganic pyrophosphatase, hexosediphosphatase, and adenyl-pyrophosphatase, the last is the least stable but may not be completely destroyed even after 2 weeks at 0°C and 16-hour dialysis. The powder obtained by pptg. muscle extract with acetone is free from adenyl-pyrophosphatase although it contains the other two phosphatases. This preparation readily dephosphorylates phosphoglycetate (but not creatine phosphate) in presence of small quantities of Mg· and adenyl-pyrophosphate. The dephosphorylation is inhibited by NaF but not by sodium iodoacetate, and is accelerated by arsenate in presence of adenosine pyrophosphate, Mg and cozymase. Creatine phosphate is also slowly decomposed by this enzyme system in presence of arsenate. The rôle of adenosine pyrophosphate in promoting dephosphorylation in the absence of any known mechanism for effecting its breakdown into adenylic acid is discussed.

B. M.

271. Pillai, R. K.—Action of arsenate in glycolysis. *Biochem. J.*, XXXII, pp. 1961–1973, (1938).

Adenyl-pyrophosphate in muscle extract containing no adenyl-pyrophosphatase forms adenylic acid and PO_4''' in the presence of AsO_4''', cozymase, phosphoglycerate, and NaF. The activation of hexose diphosphate by AsO_4''' occurs in two stages: (1) Oxido-reduction between triose phosphate and pyruvate (or acetaldehyde), and (2) the dephosphorylation of phosphoglycerate. (1) and (2) are activated by stoichiometric amounts of adenylic acid and PO_4''' which are esterified simultaneously and then broken down again, in the presence of AsO_4'''', by the phosphoglycerate formed from triose phosphate. The reaction may involve reduction of the phosphoglycerate to triosephosphate and formation of a cozymase pyrophosphate as an intermediate. Creatine phosphate can break down similarly in presence of AsO_4'''', cozymase, Mg, phosphoglycerate, and NaF without acid. The AsO_4'''-activated breakdown of adenyl-pyrophosphate might prevent esterification of carbohydrate and account for the inhibition of glycolysis observed with AsO_4'''.

R. G.

272. Rakshit, P. C.—Effect of chlorophyll on the auto-oxidation of ascorbic acid. *Biochem. Z.*, CCXCVII, pp. 153–155, (1938).

Chlorophyll -*a* and -*b* in low concentrations suspended in aqueous acetone or emulsified with lecithin protect ascorbic acid from oxidation by O_2. Measurements of -*a* and light absorption of mixtures of chlorophyll with ascorbic acid show that the substances do not form a complex compound. Carotene does not protect ascorbic acid from oxidation by O_2.

B. M.

273. Rao, W. V. S., Krishnamurti, P. V. and Rao, G. G.—Microbiological oxidation of ammonia. I. Formation of intermediate products. *Joyrn. Ind. Chem. Soc.*, XV, pp. 599–603, (1938).

Ammonium hydroxide could not be detected in the nitrification of ammonium sulphate by soil bacteria. NO′ cannot be detected in presence of NO_4' by Corbet's test.

W. V. S. R.

274. Sharma, G. L.—Observation on the sugar tolerance of healthy aged Indians. *Journ. Ind. Med. Association*, VII, pp. 641–644, (1938).

Blood sugar, after a dose of 50 gms. of glucose, was estimated in 20 healthy Indians above the age of 60. The result yielded five types of different curves such as normal adult type, storage defect curve, 'lag' curve, 'flat curve', diabetic curve and the percentages were 15, 50, 10, 5, 20 respectively. The renal threshold was found uniformly raised in a majority of subjects.

N. D.

275. Sreenivasaya, M. and Pirie, N. W.—The disintegration of tobacco mosaic virus preparations with sodium dodecyl sulphate. *Biochem. J.*, XXXII, pp. 1707–1710, (1938).

The kinetics of the disintegration of a tobacco mosaic virus preparation by sodium dodecyl sulphate are described and also the preparation and properties of the resulting unstable protein.

R. G.

276. **Srikanta, C., Shamanna, D. and Rao, G. S. R.**—Blood-sugar: Variation of blood-sugar during menstrual cycle. *Proc. Ind. Acad. Sci.*, VII, B, pp. 225–229, (1938).

The blood-sugar by Maclean's method, 4½ hours after food, of 7 South Indian women students was 80–93 mg.-% with a rise and fall during menstruation. The fasting blood-sugar for the same group was 77–90 mg.-%. B. M.

277. **Srikanta, C., Shamanna. D. and Rao, G. S. R.**—Blood-sugar: Fasting blood-sugar of South Indian students in Mysore. *Proc. Ind. Acad. Sci.*, VII, B, pp. 230–234, (1938).

The blood-sugar of 107 male students of Mysore, fasted for 12 hours, was between 67 and 118 mg.-% (average 78) and no differences were observed between smokers and non-smokers. B. M.

278. **Srikanta, C. and Shamanna, D.**—Blood-sugar of children. *Proc. Ind. Acad. Sci.*, VII, B, pp. 235–238, (1938).

The fasting blood-sugar of 71 children between 1¼ and 4 years old was between 48 and 100 mg. with an average of 74 mg.-%. B. M.

MUSCLE PHYSIOLOGY.

279. **Singh, I.**—Factors affecting sodium, potassium, and total base content of anterior retractor of byssus of *Mytilus edulis*. *J. Physiol.*, XCI, pp. 298–412, (1938).

Fuller details are given of some earlier experiments (*Physiol. Abs.*, 1937, XXII, p. 366). Also immersion in solutions of certain univalent ions causes muscle to gain weight and base in the following order: $Li<Na<NH_4<K$; $Cl<Br<NO_3<I<CNS<CN$. With bivalent cations base is gained in the order $Ca<Sr<Ba$. Mechanical friction increases the gain in weight produced by the above ions. Small concentrations of calcium, magnesium, potassium, and decrease in pH partly antagonise the effects of some of the above cations. Tone of muscle greatly increases under conditions in which total base and sodium content of muscle increase. B. M.

280. **Singh, I.**—Effects of interaction of ions, drugs, and electrical stimulation as indicated by contraction of anterior of byssus of *Mytilus edulis*. *J. Physiol.*, XCII, pp. 62–92, (1938).

Excitability to a.c. and sensitivity to potassium are affected in opposite directions by the agents studied, *viz.*, cations, anions, drugs, seasonal variations, and electrical stimulation. Various physiological effects of certain univalent cations and anions vary in the same order as these cause swelling and gain of total base: $Li<Na<NH_4<K$; $Cl<Br<NO_3<CNS<CN$. The same holds for bivalent cations: $Ca<Sr<Ba$. Two types of contraction are revealed: (1) the a.c. group, (2) the potassium group; the latter includes contraction produced by chemical stimulation, mechanical stimulation, certain contractures produced as a result of a.c. stimulation, and spontaneous contracture or tone. B. M.

281. **Singh, I.**—Isotonic extension and shortening of anterior retractor of byssus of *Mytilus edulis*. *J. Physiol.*, XCII, pp. 232–240, (1938).

Isotonic extension curves of *Mytilus* plain muscle resemble those of frog sartorius stretched while in contracture. Substances that make the muscle contract decrease the rate of extension and increase the rate of shortening. Certain substances increase or decrease the rate of extension as well as that of shortening; stretch curves of this plain muscle resemble those of human hair. B. M.

282. SINGH, I.—Effect of adaptation to electrical and chemical stimulation on excitability of anterior retractor of byssus of *Mytilus edulis*. *J. Physiol.*, XCII, pp. 241–248, (1938).

This unstriated muscle relaxes, after preliminary contraction, during continued electrical stimulation (a.c.) or chemical stimulation, *i.e.*, it becomes in some way adapted to the stimulus. NaCl, NaCN, $BaCl_2$, and rise of temperature decrease adaptation to the stimulus; adaptation to the first three is slow. Ca (0·01-0·02M-$CaCl_3$), Mg (0·04M), and K (0·01-0·02M) increase adaptation. Adaptation to K is decreased by NaCl, NaBr, $NaNO_3$, and calcium (0·01-0·02M), and increased by rise of temperature (15–35°) and decrease of pH.

B. M.

283. SINGH, I.—Effect of calcium and some other factors on excitability of anterior retractor of byssus of *Mytilus edulis*. *J. Physiol.*, XCIV, pp. 322–336, (1938).

Calcium-free saline diminishes the excitability to alternating current; immersion in calcium-rich saline and then restoration to *Mytilus* saline increases it. The Na contracture is neutralised by a.c. (10 v., 10 sec.). Sensitivity to Na ions is increased for the first 2-3 sec. during passage of a.c.; thereafter it decreases. During continued stimulation with a.c. (10 v., 5 min.) the muscle behaves as with excess of cations; sensitivity is first increased to cations, then decreased, then increased again. When the muscle is stimulated continuously or frequently with a.c., and continuously with Ba, the excitability alternately waxes and wanes. Tone is inhibited by subliminal chemical or a.c. stimuli; it is a continuous contraction produced by fusion of contractions, the relaxation of which is very slow and probably a passive process; such a contraction is produced by NaCl and $BaCl_2$ and can be maintained for hours.

B. M.

284. SINGH, I.—Properties of tonic contractions produced by electrical stimulation of anterior retractor of byssus of *Mytilus edulis*. *J. Physiol.*, XCVI, pp. 1–12, (1938).

Properties of the a.c. off-contracture are those of the K contraction; characteristics of the tonic part of the d.c. contraction are those of the Na contraction; substances that produce contracture prolong the relaxation of an a.c. contraction in K-sensitive muscles.

B. M.

VETERINARY SCIENCE

(including Veterinary Pathology, Bacteriology, Helminthology, etc.).

285. AYYAR, A. KRISHNASWAMI—Veterinary Surgery and Surgical Instruments of Ancient India. *Agric. & Live-stock in India*, IX, pp. 18–25, (1938).

In this paper the author traces the origin and development of the art of healing from the pre-mythological period to the mythological one and has tried to show how veterinary science was the pioneer of all medical sciences in the world. Thereon, he describes the state of surgery in pre-historic India and the advancement of veterinary surgery at that time in common with all other sciences. Several veterinary surgical instruments in use in those days have been described in detail and the illustrative diagrams thereof have been appended. The article concludes with an assurance by the author that efforts to bring to light all the information lying latent in the few surviving old dormant literature will afford ample scope for widespread research among professional veterinarians.

A. K. A.

286. DATTA, S. C. A.—Field diagnosis of bovine mastitis. *Punjab Vet. Journ.*, XXVI, pp. 8–12, (1938).

The article contains valuable information on the routine method for the diagnosis of bovine mastitis under field conditions. Various causes of mastitis are detailed. The tests to be applied in a complete survey of the herd for the presence and extent of the disease are also detailed.

S. G.

287. **Hussain, Iqbal**—Leeches in Dogs. *Punjab Vet. Journ.*, XXVI, pp. 13–15, (1938).

The author describes a method of extracting leeches from the nostrils of dogs. This consists in shutting the affected dog in an artificially heated room so as to induce panting in the dog by making it feel thirsty. A piece of cotton wool soaked in cold water is now placed against the nostril and the current of cool air thereby generated tempts the leech to protrude from the nostril, when it is firmly gripped between cloth-covered fingers and pulled out quickly.

S. K. S.

288. **Idnani, J. A.**—*Babesia bovis* Starcovici, 1893, as the cause of Redwater in an Indian Buffalo. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, part 2, pp. 99–101, (1938).

Haemoglobinuric fever in an Indian buffalo ascribable to what appears to be *Babesia bovis* Starcovici, 1893, infection for the first time in this country is recorded. Blood smears from this animal were forwarded to the author from one of the Military Dairy Farms with the history of acute piroplasmosis associated with haemoglobinuria. Trypan blue had been administered without producing any effect. On examination of the smears, the parasites were observed to be much smaller than those of the tropical redwater, *viz.*, *Babesia bigemina*; the angle at which the painted ends of the double pears met was widely divergent and in some cases falling in a straight line. The characteristic marginal position of the parasites in the infected red cells was noticed. The morphology of the organisms as compared with that of *Babesia bovis* described by Wenyon (1926) presented no difference.

J. A. I.

289. **Iyer, P. R. Krishna**—A form of Verminous Ophthalmia in Equines. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, part 1, pp. 3–11, pl. 2, (1938).

The paper elucidates the etiology of the so-called 'Periodic Ophthalmia' of horses in some of the horse-breeding farms in the Punjab. The disease, which has no seasonal incidence, is shown to be a microfilariasis of the eyes and associated lachrymal glands. The parasite has not been identified but appears 'to belong to some Onchocercoid worm'. A biting fly is suspected to be the transmitting agent.

M. Y. M.

290. **Naidu, P. M. N.**—Rabies prophylaxis in dogs with special reference to the development of the single injection method in Mysore. *Ind. Vet. Journ.*, XV, pp. 21–28, 3 tables, (1938).

The author suggests single injection method of vaccination against rabies in preference to the established methods of vaccination on Pasteur's formula. The encouraging results of preventive vaccination (single injection) in Japan, since its introduction by Umeno and Doi, are well demonstrated by facts. The relative merits of all the available antirabic vaccines were ascertained with a view to the selection of one as a safe and efficient preventive and another as a curative product. The results achieved so far favour the Japanese single injection method for prophylaxis and, on the curative side, the Nigerian modification of Sir Semple's vaccine (Kasauli method) and the Italian modification (Finzi) of the Japanese vaccine are under investigation and have given encouraging results.

P. M. N. N.

291. **Narayan, D.** and **Singh, K. R.**—Observations on Cattle Dipping at the Imperial Cattle Breeding Farm, Karnal. *Agri. & Live-stock in India*, VIII, pp. 48–55, (1938).

The authors describe and illustrate a dipping tank and record having obtained good results from the use of 'Cooper's cattle stock dip solution' in combating cattle ticks and eradicating ringworm in calves. Dipping, however, had little effect on full-grown ticks but was particularly effective against young ones. It was also found to afford some protection to the animals from biting flies and mosquitoes.

S. K. S.

292. SARWAR, S. M.—Use of Rinderpest goat tissue virus vaccine under field conditions in the Punjab. *Punjab Vet. Journ.*, XXVI, part 6, pp. 1–18, (1938).

The difficulties arising from goat vaccination against rinderpest using goat adapted tissue vaccine under field conditions in the Punjab are described. Absence of reaction after the inoculation is generally accompanied by the existence of a previous history of the occurrence of rinderpest in the inoculated area. However, in certain cases the vaccine at the time of inoculation may not be available. Methods for overcoming the difficulties are discussed. Adequate control measures for severe reactions following vaccination, accompanied with loss in milk yield and resuscitation of piroplasmosis, theileriasis, trypanosomiasis and coccidiosis are also discussed.

S. G.

293. STEVENSON, G. F.—An outbreak of Anthrax in a mountain battery in Waziristan. *J. Royal Army Vet. Corps*, IX, p. 109, (1938).

An outbreak of anthrax amongst battery mules and horses in Waziristan during the active operations of 1937 is described. There were nineteen deaths in all, but bacill were demonstrated in smears made from ear veins only in three instances demonstrating the difficulty of arriving at a diagnosis of anthrax in equines by smears from the peripheral blood supply. Culture and guinea-pig inoculation, however, proved the diagnosis From samples sent to the Imperial Veterinary Research Institute, Mukteswar, the source of infection was shown to be a consignment of green fodder. The outbreak was brought under control by destruction of the infected fodder, evacuation of the battery lines, isolation of animals showing pyrexia and the use of anti-anthrax serum.

V. R. R.

ANIMAL NUTRITION

(including Animal Breeding).

294. BANERJEE, B. N. and DATTA, N. C.—Carotinoid feeding and goat's milk *Agric. & Live-stock in India*, VIII, p. 563, (1938).

The possibilities of feeding goats with tender leaves, carrots and grasses have been studied. The physiology of the goat is different from the cow or buffalo, in that it either converts carotene into vitamin A or rejects it. No carotene or xanthopyll can be detected in blood or milk fat even with excessive feeding. The nature of the carotene can be judged from the carotene content of the feed and feces, and vitamin A of the milk fat. Grasses are rich in beta carotene and leaves contain a high percentage of alpha and gama carotene The vitamin A content of the milk fat can be increased with proper carotinoid feeding but the keeping quality of vitamin A in milk fat is poor. The flow of milk as also the quantity improves with carotinoid feeding.

B. N. B.

295. BHARUCHA, F. R.—The Problem of Grassland Improvement in India *Current Science*, VI, pp. 600-601, (1938).

In the article the author emphasises the value of a grassland survey in India especially as the country is not a grassland country. He also expresses the need of establishing a separate Grassland Research Institute for India with powers to evolve a practical programme of management of different types of grasslands.

F. R. B.

296. BOSE, R. D.—Improved Pusa Oats for Fodder Production. *Agric & Live-stock in India*, VIII, p. 245, (1938).

The problem of providing suitable fodder and forage to the cattle population of India is one of the main limiting factors in all schemes of cattle improvement. The importance of oats for cattle feed has been brought out in this paper and adequate trials with Pusa oats are recommended to those who are interested in the improvement and welfare of the cattle in this country.

The Pusa selections, B.S. 1 and B.S. 2 oats and hybrids between some of these and the Scotch Potato oat, especially hybrids C, G and J, have established their reputation in Northern India and are available for distribution.

R. D. B.

297. CARBERY, M. and CHATTERJEE, I. B.—Preliminary note on the behaviour of rice *Kura* (bran) as a cattle feed. *Agric. & Live-stock in India*, VIII, p. 367, (1938).

The bran and rice polish form a large supply (probably about 32 million maunds) of cheap and easily available cattle feed. The bran is very rich in oil, P_2O_5, and also MgO but very poor in lime. Preliminary experiments conducted with rice straw at Dacca Animal Nutrition Section show that the results were poor. The cause of it is suggested to be associated with maladjustment of minerals, existence of phosphorus as phytin and possible presence of decalcifying factors. M. C.

298. CHATTERJEE, I. B. and MD. ABDUL HYE—The value of *Aus* paddy straw as a fodder. *Agric. & Live-stock in India*, VIII, p. 361, (1938).

The experiments conducted at the Animal Nutrition Section in Bengal show that *Aus* or Autumn rice straw is a much better roughage than *Aman* or Winter rice straw with respect to protein, lime and phosphorus. Data have been presented showing the behaviour in live-weight, consumption, total digestible nutrients, etc. all pointing in favour of *Aus* straw. I. B. C.

299. CHATTERJEE, I. B. and MD. ABDUL HYE—Can Water Hyacinth be used as a cattle feed? *Agric. & Live-stock in India*, VIII, p. 547, (1938).

As, on account of fodder scarcity, hyacinth is used as cattle feed in some parts of Bengal, its investigation was started to test its effect when given (1) with rice straw and (2) with rice straw and cake. It is noticed that in the former case the results were poor but better results were obtained with cake. The hyacinth is very rich in potassium and chlorine and also lime. The palatability appears to vary with locality, season and more or less with individual likes and dislikes. Under the fodder scarcity of the province its partial use is unavoidable but it is better to feed it in controlled amount and always supplemented with cake. I. B. C.

300. CHATTERJEE, I. B. and TALAPATRA, S. K.—The lime and phosphorus requirement of Bengal cattle. *Agric. & Live-stock in India*, VIII, p. 559, (1938)

Data from 24 individual tests have been presented suggesting the requirement of lime and phosphorus to be 48 grms. CaO and 29 grms. P_2O_5 per 1,000 lbs. live-weight under the condition of rice straw feeding. The lime assimilation from rice straw is low and the requirement appears to be higher than under many other feeds. The phosphate deficiency is very large. I. B. C.

301. DAVE, C. N.—An investigation into the incorporation of foam in milk by City Gavalies. *Poona Agri. Coll. Mag.*, XXIX, pp. 138–143, (1938).

The author has found that in the system of milking animals at the customer's door, the gavali is able to measure out about 12% of foam in milk immediately after milking and that most of the foam subsides when milk is kept undisturbed for five minutes after milking or passed through a sieve or a filter cloth immediately after milking. The rate of drawing the milk was about one pound and two ounces per minute. H. C. V.

302. DAVE, C. N.—Manufacture of Desiccated milk. *Poona Agri. Coll. Mag.*, XXX, pp. 49–53, (1938).

The article presents a brief description of the equipment employed for and the process of making mava, khava or khave in the Bombay Presidency. The author found that the average time required for converting three to four pounds of milk into khava was about nine minutes, and the yield from milk of Mahsana buffaloes was 24·7% and from Jaffarabadi buffaloes 23·4%. Results of the chemical analysis of one sample of khava gave moisture 12·08, ash 4·56, ether extract 28·40 and casein 21·59 as against 24·15, 3·65, 19·33 and 31·45 respectively of the other.

H. C. V.

303. Dave, C. N.—A study of Surti buffaloes reared at the Poona Agricultural College Dairy. *Agric. & Live-stock in India*, VIII, p. 407, (1938).

The author describes the performance of Surti breed of buffaloes bred and brought up at the Agricultural College Dairy, Poona (India), where stall feeding of green fodder such as lucerne, maize and chavali, oats and peas, guinea grass and jowar varieties supplemented with a little chaffed *Kadbi* is practised. With regard to concentrates a mixture consisting of wheat bran, groundnut cake, cotton seed and crushed *Kulthi* (*Dolichos biflorus*) is fed to animals at the rate of 4·5 to 5 lbs. for every 10 lbs. of milk yield testing about 7·5 per cent fat. The study refers to the natural trend of calving of 335 animals with special reference to first calving in different months of the year together with the detailed study of 218 farm bred animals on their mean lactation length, dry days, lactation yield, annual average yield and persistency of milk yield month by month in different lactations summarised as follows:—1: About 70 per cent Surti buffaloes calve from August to November, the least being 4 per cent in April. 2: About 83 per cent of first calvings occur between August to November, there being no first calvings from April to July. 3: On an average of ten lactations, a Surti buffalo yields milk for 350 days, remains dry for 111 days and conceives 148 days after calving; the first lactation being the longest, *viz.*, 383 days and the sixth being the shortest, *viz.*, 301 days. 4: The mean month-to-month decline in milk yield during different lactations works out to 10·23 per cent, the minimum and maximum being 7·63 per cent and 12·47 per cent in 1st and 7th to 10th lactations respectively. 5: The mean lactation yield and annual average yield works out to 4,600 lbs. and 3,900 lbs. respectively.

C. N. D.

304. Iyer, A. V. and Ayyar, N. K.—A study of the mineral assimilation of growing calves. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, p. 43, (1938).

Two lots of 4 bull calves each were fed on a basal ration of hay, guinea grass, wheat bran and groundnut cake adjusted to provide a liberal amount of protein for maintenance and growth. The hay was poor in phosphoric acid. One group was given a supplement of 30 grams of calcium phosphate. The groups were reversed at the end of 17 weeks and again at the end of 12 weeks. No effect on digestibility, food consumption or live-weight increase was noticed.

It was concluded from this experiment that when the minerals were sufficient on the basal ration a supplement of calcium phosphate had no visible effect except for a greater retention of calcium and phosphorus when receiving the supplement.

T. S. K.

305. Makhijani, J. K. and Banerjee, B. N.—Some experiments on the carotene content of grasses and concentrates and the feeding of Guinea grass to dairy cows. *Ind Journ. Vet. Sci. & Anim. Husb.*, VIII, p. 13, (1938).

The carotene content of 73 grasses and fodders as well as 52 samples of concentrates are given. The effect of increased carotene feeding, as Guinea grass, to dairy cows and their effect on the carotene of butter-fat and blood was studied in a short experiment. No pronounced effect was noticed.

T. S. K.

306. Misra, R. P.—A new device to check self-pollution in cows. *Agric. & Live-stock in India*, VIII, pp. 44–47, (1938).

Self-pollution is a vice of cows attempting to drink their own milk by suckling. The author finds that an aluminium disc clipped into the nostrils of the animal serves as a simple, safe and sure means of checking the habit.

T. S. K.

307. **Sayer, W.**—The Influence of Skeletal Alterations on the Milch Qualities of the Sahiwal Breed. *Agric. & Live-stock in India*, VIII, pp. 541–546, pl. v, (1938).

In this paper the author deals with the necessity of straightening the top line and bending out the pronounced sheath in the Sahiwal breed which are at present hampering the improvement of the udder and milk yield and also tending to make for sluggishness in the stud bull; with a tighter sheath a bull is able to continue service for a longer period. Work on the above lines carried out on the Pusa Pedigree Sahiwal Herd and the results obtained are also given in the paper.

W. S.

308. **Sivasubramanian, V.** and **Dover, C. W.**—A comparative study of the carotene of the dairy cow and the dairy buffalo. *Ind. Journ. Vet. Sci. & Anim. Husb.*, VIII, pp. 29–32, (1938).

Buffaloes' colostrum is higher in specific gravity, acidity, sodium chloride, total solids, total protein, casein, albumin, globulin and ash than cows' colostrum, while in lactose it is lower. In both animals there is a progressive fall in all the constituents except lactose, which shows an increase and fat which is irregular. Globulin constitutes the major part of the total protein of both kinds of colostrum soon after calving, and its decrease is more marked during the first 24 hours after parturition than during the remainder of the colostral period. Buffaloes' colostrum changes to normal milk in about three days while cows' colostrum takes about four days.

T. S. K.

309. **Smith, J. A. B.**, **Howat, G. R.** and **Ray, S. C.**—Composition of blood and milk of lactating cows during inanition, with a note on an unidentified constituent present in certain samples of abnormal milk. *Journ. Dairy Res.*, IX, p. 310, (1938).

Cows were starved for 12 days and yields and milk composition determined. Yield decreased to one-seventh in ten days, with a rapid drop in the first 3 days. Protein increased by 20% by the 9th day with little change in the N distribution. Fat rose rapidly with fall of yield, one value of 9·4% being obtained, but the yield of fat fell to less than half in 12 days. Lactose decreased and Cl increased considerably. One cow suffering from milk fever during the fasting period gave milk showing greater fluctuations in composition than that from normal fasting cows. The sum of the separately-determined constituents fell short of the determined solids (not fat) 0·3–2% of the milk, but the nature of the undetermined substance was not discovered. Inanition is accompanied by changes in blood composition which are related to the changes in milk composition.

B. M.

310. **Smith, J. A. B.** and **Dastur, N. N.**—Secretion of milk. I. Effect of inanition on the lipins of the lactating cow. *Biochem. J.*, XXXII, pp. 1856–67, (1938).

The lipins of the erythrocytes are only slightly affected by a 12-day fast, whilst plasma-lipins are reduced by 40–50% and persist for some weeks at these levels even after food is given. The actual composition is unaffected in either the plasma or the erythrocytes in starvation, although plasma-fatty acids are more unsaturated in cases of milk fever.

B. M.

311. **Smith, J. A. B.** and **Dastur, N. N.**—Secretion of milk. II. Effect of inanition on yield and composition of milk fat. *Biochem. J.*, XXXII, pp. 1868–76, (1938).

The fatty acids of milk up to and including C_{14} decrease by, whilst oleic acid increases by, about 80% following inanition. It is suggested that the lower fatty acids are normally by-products in the synthesis of oleic acid, which synthesis proceeds almost to completion when the total fat production is diminished, as during inanition.

B. M.

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